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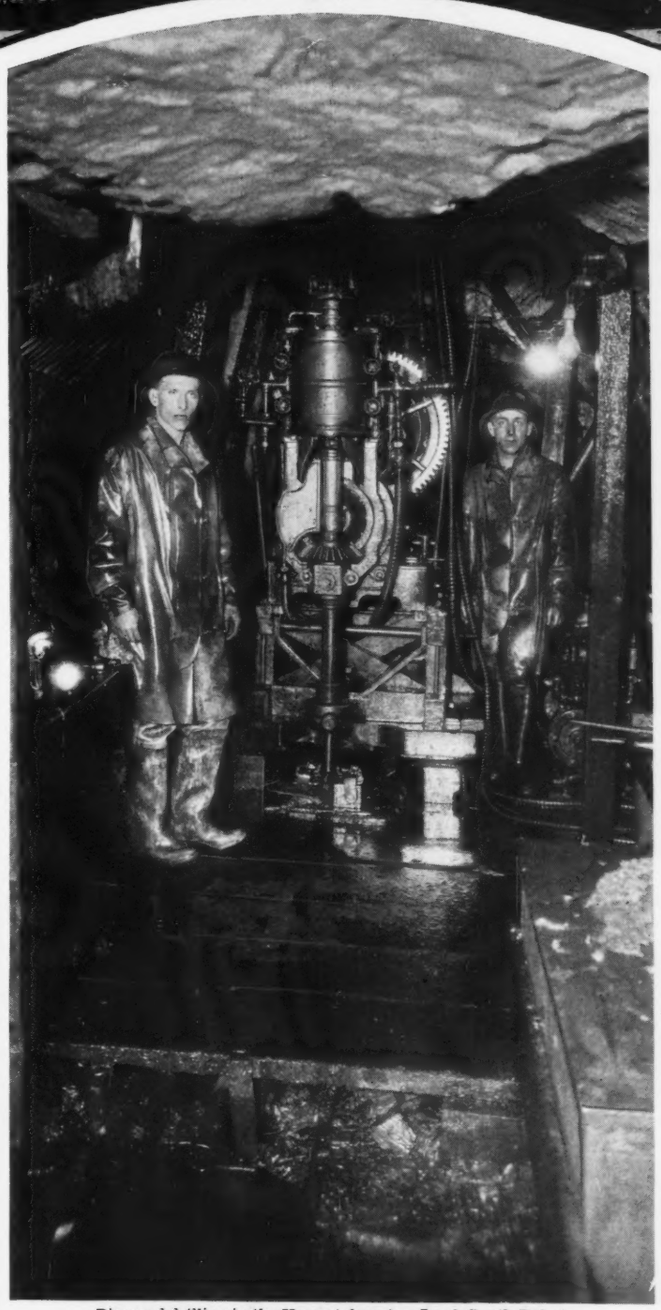

Diamond drilling in the Homestake mine, Lead, South Dakota

Prohibition and the Mining Industry—A Symposium

The Wilshire Gold Mine

By H. W. Turner

Diamond Drilling in El Potosí Mine

By Harlan A. Walker

Determining the Proper Mine Locomotive

By Graham Bright

A WEEKLY JOURNAL REPRESENTING THE WORLD'S MINING AND METAL INDUSTRIES

November 18, 1922

UPPER—Overhead Belt Conveyor Served by Tripper Distributes to Coal Bunker Below.

LOWER RIGHT—Another View of the S-A Distributing Belt Conveyor.

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Volume 114 | New York, November 18, 1922 | *Number* 21

Prohibition and the Mining Industries

A CORRESPONDENT recently wrote us from Australia inquiring as to the actual effect that prohibition had so far had on the mining industries of the United States. Australia is a progressive, not to say a daring, commonwealth; she has herself experimented along various advanced lines, and she is ready to try anything which the United States has experimented on, with a favorable result. In the Western world the United States has instituted the greatest experiment in this type of benevolent repression. What have been the differences observable in the mining industries since the Eighteenth Amendment and the Volstead Law went into effect?

What we want to know is not theory, or belief, or personal feeling; but the results of dispassionate comparative observation. And in order to widen our own breadth of observation and comparison, we have written to a number of prominent mining men, in different parts of the country, asking for their observations. A number of the letters which we received in reply are presented on pages 891 to 895. They are sufficiently varied to show that there are two sides to the problem, and that the conflicting evidence on each side of the scale is to be weighed carefully.

Mr. Arthur Thacher, for example, with long experience in the lead and zinc regions of Missouri and nearby states, believes there is still plenty of liquor consumed by the workmen in his districts. Mr. George E. Collins, reflecting the observation of Colorado, reports that in his opinion there is much less drinking than in pre-prohibition days, but also much less respect for the law. This is a serious element. Bootlegging, he reports, is increasing; and the knowledge of how to manufacture cheap whisky privately is becoming a widespread and permanent accomplishment.

Mr. Charles A. Chase also finds the enforcement of anti-liquor law in Colorado less than in the old days of state prohibition. Nevertheless, he believes that prohibition is beneficent and should be enforced. Mr. W. H. Blackburn reports at Tonopah a condition similar to that above for Colorado—an increase in bootlegging and drunkenness, although both miner and operator in general recognize the beneficial effects which come from actual prohibition.

Mr. James MacNaughton, general manager of the Calumet & Hecla, in Michigan, advises that there has been an exodus of workmen from the mines since the prohibition laws went into effect, and a consequent shortage of labor, in which prohibition may perhaps have some part, since the foreign miner does not care to live in a country where he cannot get his beer and wine. On the other hand, there have been fewer accidents and a decrease in lost time in Michigan under prohibition than formerly.

A very thoughtful letter from Mr. William Kelly concludes that prohibition has had some favorable results in the Lake Superior iron mining region, but stresses the considerable attendant evils, lawbreaking and bootlegging; so that the good and evil results are pretty well balanced.

Mr. John C. Greenway, general manager of the Calumet & Arizona, advises that in Bisbee the general effect of prohibition has been good. Accidents have decreased; and savings-bank deposits have increased.

Mr. Arthur Notman, of the Phelps Dodge Corporation, is also of the opinion that in general miners and their families have been benefited, in Bisbee, although he finds that there have been great difficulties in the enforcement of the law.

Mr. B. C. Yates, of the Homestake Mining Co., states that the effect of prohibition during the first year was very good, but that bootlegging and moonshining are on the increase. The question is one of enforcement.

Mr. Stanly A. Easton, general manager of the Bunker Hill & Sullivan, writes that in the Coeur d'Alene district, in Idaho, prohibition has been of the utmost benefit to the industry and to the individual. The miners have a better average efficiency, a better physical and mental condition, accidents have decreased, and bootlegging and home brewing are diminishing and not increasing. The labor shortage, he believes, may be in part due to prohibition, but the recited benefits more than offset this disadvantage.

Mr. Louis S. Cates, general manager of the Utah Copper Co., is quite of the same mind as Mr. Easton and Mr. Greenway. He observes increased efficiency, less labor agitation, and a higher standard of living for employees; and (a very important point) the wives and children have better care. There is less lost time; there are more shoes, electric lights, and telephones. Bootlegging here, too, is on the wane; the fatal effect, every now and then, of poisonous moonshine liquor acts as a deterrent from much liquor consumption.

Mr. Robert Linton, president of the North Butte, in Montana, and of other companies, finds that the effects of the prohibition laws vary in different sections of the country. In old, settled camps the result has been beneficial, the law being better enforced; but in many of the western mining camps the law is not enforced, and the use of bad liquor is prevalent, with its consequent serious inroads in physical and mental health; and a widespread and grave contempt for law has been engendered.

From these and other interesting letters the argument for and against may be summarized:

For: Increased efficiency, fewer accidents, less time lost, lower labor turnover, greater individual savings, greater comforts and luxuries, better care of families.

Against: Labor shortage, bootlegging, poisonous liquor, home brewing, disrespect for the law.

Considering these important points on both sides, the case in favor of prohibition appears still to be strongly presented, especially in view of the testimony that in many districts bootlegging and the drinking of a vile quality of liquor are on the wane. There then remains the serious charge, the undoubted condition, of a

widespread disregard and disrespect for the law—for the prohibition laws. This, as we all know, is practically universal, and one in which advocates of prohibition and its opponents in many cases find a common ground. Even those who find that prohibition has worked an improvement will often not forgive the fact that it was imposed on the country by a zealous and officious minority; and they resent the challenge to their personal freedom to decide whether they shall or shall not take a drink; they are apt to despise paternalism and the continuous hedging in of daily actions by law, enforced often by agents of the law with bad manners and low standards of conduct.

If, however, the American public as a whole should be convinced of the great practical advantages of prohibition, it is likely that the prevalent disrespect will be gradually changed into co-operation and support. In New York and the other great cities of the Atlantic seaboard the general public opinion of rich and poor, of teetotaler and drinker, is strongly against prohibition, according to our observation. Bootlegging, graft, and bad liquor are evils of monstrous dimensions. Anyone can obtain all the liquor he desires, but at high prices—which of course automatically limits its consumption. But as for the mining industries of the country at large, we are bound to believe, from the testimony which we have recorded, that a general economic, physical, and mental improvement has been effected; and a growing recognition of this—if this indeed be true—will foster slowly an increased general respect for, or at least a greater public toleration, of the law.

The more likely immediate outcome, as recent elections indicate, is an effort to repeal the Volstead Act, and the subsequent interpretation of the Eighteenth Amendment in certain states as permitting light wines and beer, this interpretation varying in different sections of the country from absolute exclusion of alcoholic drinks to the most liberal interpretation of what constitutes intoxicating beverages.

The Doings of the World

RECENT DEVELOPMENTS in Europe have added another memorable chapter to history. In Italy the so-called Fascisti have taken control of the government without the formality of an election. The Fascisti are nationalists, as opposed to internationalism; they are opposed not only to bolshevism but to socialism in general. This is Italy's answer to the relatively recent attempt of Russian bolshevism to capture Italy. In England, the coalition government under the leadership of a Liberal, Lloyd George, has fallen, and the Conservatives have taken charge. The Laborites have been snowed under in the British elections. To comprehend this, we must recall that British labor has been pro-bolshevistic, while American labor has been anti-bolshevistic. Italian labor has joined the anti-bolshevist ranks, in supporting the Fascisti, as it has so largely done.

In Turkey, nationalism has been as rampant as in Italy. The victorious Turkish army has deposed the Sultan, and effected thus a separation of Church and State. The Sultan will be henceforth, as Caliph, the spiritual head, but the head of the government will be chosen by the Turkish Congress or Assembly, presumably from among the royal family, although some movement to elect a government head outside the royal family, such as choosing the victorious chief, Kemal Pasha, for president, is going on.

We may look upon all these recent manifestations without excitement or trepidation, and even with satisfaction. Democracy is, taking things by and large, gaining the ascendency over despotic autocracy on the one hand and despotic bolshevism on the other. The pendulum is seeking a resting place. A healthy and moderate nationalism is the soundest preparation for helpful international co-ordination.

In Germany, finances are in a state of collapse. Economic conditions are demoralized; the economic defeat has been worse than the military defeat. The government is and has been in the hands of the democratic element—the middle-of-the-road party—opposed alike by the monarchists and by the bolshevists. It is doing the best it can; and it should have sympathy and assistance in its gigantic task of paying the bill of the enormous disaster in which the now discredited military party involved the nation. We have nothing to fear from democracy, in any nation.

As a detail, Sir Basil Thompson, formerly chief of the British Secret Service, recently stated publicly in New York that the Kaiser was forced by army chiefs against his will to authorize the invasion of Belgium, the alternative being abdication; that he never was more than a rubber stamp thereafter, and that he was forcibly removed to Holland by the same military chiefs after the war. So dies another popular belief.

A Bureau of Mines Forum

DURING THE WAR PERIOD Congress provided the Bureau of Mines with a special appropriation to undertake all necessary work in encouraging increased production of minerals that were deemed essential for military purposes. A staff of engineers under the direction of Mr. J. E. Spurr, Executive of War Minerals Investigations, fulfilled the duties imposed by this act. From the activities of each engineer the Information Section compiled every month a detailed report indicating the situation regarding every problem and the progress that had been made from the previous month. Primarily, these monthly reports were for the guidance of the Executive of War Minerals Investigations, but the information contained therein was so essential to a proper conduct of certain war activities that a limited number of mimeographed copies were sent each month to some branches of the War Department and to other government bureaus. The scope of the reports was gradually broadened, and, during the latter part of the war, an edition, with all purely confidential matter eliminated, was issued monthly as a public document, though with limited circulation.

A small group of engineers attached to the regular staff of the Bureau of Mines were engaged in war minerals work, and familiarity with both organizations enabled them to recognize the value of the monthly reports as a permanent Bureau function. Accordingly, after the armistice, when war minerals activities were gradually brought to a conclusion, an effort was made to salvage the monthly reports from the wreckage of the conflict. Considerable difficulty was experienced in winning for this new activity the recognition necessary to insure success, but after some months of struggle its uncertain existence gradually attained stability, and it is now recognized as an important function of the Bureau.

Though the original monthly report related only to war minerals, the modified form adapted for normal peace-time activities covers all branches of investigations in the Bureau of Mines. The Reports of Investigations, as they are now termed, in no sense constitute a periodical. Each report covering a specific problem is bound as a separate, and this promotes economy in distribution, for each number may be sent only to those interested in the particular subject covered. The reports are issued at irregular intervals as prepared, and are listed at the end of each month.

The Reports of Investigations are not substitutes for printed reports, but are supplemental thereto. One great drawback to printed bulletins is the long period of time that elapses from the completion of the problem to the appearance of the report. It is notorious that some government publications are hopelessly out of date when they finally appear before the world after their deliberate progress through editorial halls and hospitable printing establishment. The mimeographed reports have the great advantage of bringing the results of investigations to public attention with little loss of time. They are of particular value in giving publicity to certain phases of the larger problems that are of immediate interest, or in presenting the several parts of a broad and comprehensive study, chapters that may subsequently, in more complete and detailed form, be combined into a final printed report. This phase of the Bureau's work fills a popular demand, and will undoubtedly grow in importance.

Further to increase their usefulness, the Reports of Investigations are now being used as a medium for the exchange of ideas between the miner and the Bureau. The difficulties of a certain mining problem are presented, various possible solutions are suggested, and discussion is invited by practical men actually engaged in the work. Copies of the report are sent to operators actively interested in the subject discussed. Thus an attempt is made to establish a mining forum, a long-range debating society, where the wide observation and study of Bureau engineers may be supplemented by the operator's practical horse sense and wisdom of experience. The first report of this character to be issued is Serial No. 2,401, entitled "Stripping Problems in Limestone Quarries of the Shenandoah Valley." The success of this enlarged function of the reports will depend on the extent to which operators respond to the call for co-operation, and favorable response may be expected only where there is a recognition of the Bureau's ability to render assistance of a practical nature.

Advice to Silver Miners

A CORRESPONDENT engaged in silver mining recently wrote us regarding the life of the Pittman Act and its effect upon the price of silver in the future, stating that it was something that he had just happened to hear about. We are too apt to assume that fundamental facts and conditions are a matter of common knowledge.

We repeat, then, for the benefit of those who have not studied market factors closely, that the purchases under the Pittman Act will probably be completed in about a year from now; that thereafter the producer of silver in the United States will no longer receive a dollar an ounce for his silver, but will receive the quotation in the world market, which figure at present is about 67 cents. We point out that the dumping of the American silver production on the world market will tend to depress the world quotation immediately subsequent to the cessation of the operation of the Pittman Act unless some unusual purchases by foreign governments take place. We do not anticipate further support of the price of silver from the United States Government.

Therefore we advise those who contemplate engaging in the mining of pure silver or silver-gold ores to base their plans upon a price for silver very considerably lower than they are now receiving. The world market for silver, even with the United States production of silver eliminated, does not show a buoyant tendency. For those to whom silver is merely a byproduct of lead or copper ores, the possible long depression in the price of silver is of course only one factor to be considered.

The corollary is for the silver-producing companies in the United States to press production to the limit, before the probable slump in the price of their product a year hence.

Refinements in Control Apparatus

THE RECENT USE of the geophone to find the position of leaks in a pipe conveying compressed air is an illustration of the fact that the application of an invention is not always limited to the purpose for which is was designed; its sphere of usefulness may spread in all directions, like the ripples caused when a pebble is thrown into the center of a pond.

The geophone is an instrument that intensifies the effect of sound waves on the organs of hearing, permitting control or knowledge of operations or movements at a distance, and through a medium that is popularly considered soundproof. This suggests the possibility of the convenient centralization of receiving apparatus, and it is interesting to note that the idea has been elaborated by a British engineer, who uses a modified form of the ordinary physician's stethoscope for the detection of abnormal noises in operating machinery. It is proposed that vulnerable parts, such as bearings and gears, shall be fitted with a special type of receiver, connected with a switchboard in the superintendent's office. Each machine in the plant can then be examined at regular intervals, at a distance and without loss of time, the result being the early detection of the abnormal conditions that usually precede a breakdown. One result of this would be that a systematized method of control would be possible at a small cost for installation and at a negligible cost for maintenance.

Refinements in control such as this suggest speculation as to how complicated or how simple the operation of machinery may be in the future; they draw attention to the fact that the successful engineer is the one who can combine acquisitiveness with inventiveness, thus demonstrating the value of catholicity of interest in the evolution of ideas and in the utilization of apparatus.

Credit to the Bureau of Mines

A CORRESPONDENT writes in calling attention to the fact that in the list of books for a mining engineer's library given by Mr. Wickes, printed on page 754 of our issue of Oct. 28, the glossary of mining terms by Fay is credited to the U. S. Geological Survey, whereas it is really a publication of the Bureau of Mines.

The Hazard of Fire Underground

By T. A. Rickard

As was to be expected, the Argonaut disaster has directed renewed attention to the risk of fire in mines. Naturally it has led to the placing of undue emphasis on this particular hazard, for in the 15 years preceding the Argonaut disaster only 17 lives had been lost in mine-fires in California. The danger due to automobile traffic on the streets of a city is much greater than that incurred by the miner underground, and there is less excuse for it. The Argonaut mine is exceptionally deep and the conditions at the time of the recent fire were unusually unfavorable, partly because obvious precautions were not enforced and obvious means for averting the disastrous loss of life were not taken promptly. The committee of investigation appointed by the Governor of California has not finished its inquiry, but the subject of fire-risks has been studied by several groups during the last month. On October 12 a special committee of the American Mining Congress at Denver prepared a series of suggestions. This committee was composed of men especially qualified to give good advice; it consisted of Charles A. Mitke (chairman), Edwin Higgins, Robert I. Kerr, J. W. Paul, William Conibear, Lucien Eaton, C. L. Berrien, and H. F. Lunt. On October 24 the State Industrial Accident Commission invited the mine operators of California to a meeting in San Francisco for the purpose of considering fire-hazards in mines. Mr. Will J. French, the chairman of the Commission, presided. He presented a number of suggestions prepared by the engineers of the Commission, Messrs. H. M. Wolflin, G. Chester Brown, and F. L. Lowell. The U. S. Bureau of Mines was represented by Messrs. George S. Rice and Byron O. Pickard. Special consideration was given to the recommendations of the Mining Congress committee as read and explained by Mr. Higgins, who besides being a member of the committee also represented the California Metal and Mineral Producers Association. A useful discussion ensued, after which a general committee was selected, including four representatives of the mine operators, four spokesmen for labor, the three engineers of the Accident Commission, two officials of the Bureau of Mines, one independent mining engineer (Mr. R. E. Tremoureux) and one representative (our Mr. George J. Young) of the technical press. This general committee selected a sub-committee consisting of Messrs. Young (chairman), Brown, Rice, Higgins, F. W. Nobs, O. McCraney, Robert Milligan, R. W. Rodda, and H. R. Plate. Of these, four represented the operators, two represented labor, and three were technicians detached from the business of mining. It was fitting that Mr. Young should be chairman, because he has made special study of the subject and there is good reason for believing that his paper 'Fires in Metalliferous Mines' (Trans. A. I. M. E., 1912) was an important factor in prompting the recommendations made by the members of the committee (W. R. Ingalls, James Douglas, J. R. Finlay, J. Parke Channing, and John Hays Hammond) appointed by the American Mining Congress in 1906 and printed as 'Rules and Regulations for Metal Mines' in Bulletin No. 75 of the U. S. Bureau of Mines, issued in 1915. The text of the recommendations by the San Francisco committee appears on another page of this issue. The discussion that shaped these recommendations was dominated throughout by the idea of 'suggestion' rather than 'regulation'; it was recognized generally that the variety of conditions under which individual mines are operated is so great as to render inadvisable any hard-and-fast set of rules and that in the last resort the proper working of any safety measures should be left to the intelligent co-operation of the official inspector and the superintendent of the mine; in short, what is required is a recognition of fundamental principles and the stimulation of a desire on the part of the mine operators to work loyally with the officials of the Industrial Accident Commission in a joint effort to minimize the risk of mine-fires. It is hoped thereby to prevent hasty legislation on the subject—such laws as might cripple the mining industry of the State without affording additional protection to the workers underground. For instance, a regulation compelling the wetting of all shafts by means of a sprinkler system would be impracticable in many mines because it would cause the ground to cave, where the wall-rock is shale or slate. Similarly the use of concrete or gunite for fire-proofing is not suitable in shafts in which the timbering requires frequent repairs. Again, the devices that are suitable in a mine 4,000 ft. deep may be unnecessary, or even absurd, in a mine that is 200 ft. deep; a simple system of signaling by rapping on a pipe-line might suffice in a small mine whereas in a mine with miles of workings something more elaborate would be needed. It is the spirit rather than the letter of any set of regulations that must be observed; it is a condition and not a theory that must be faced; the human equation cannot be eliminated from the problem.

One thing to keep in mind is that the first duty of a superintendent, when a mine is on fire, is to extricate the men in it; at the Argonaut the idea of extinguishing the fire obstructed a vision of what would happen if the fire was not extinguished promptly. The lesson of the disaster is that a competent superintendent is better insurance than any code of regulations. It is a mistake to put millwrights or mechanicians in charge of large mines; on the contrary, it is desirable that the responsibility should be shouldered by a man possessed of the miner's instinct, the quick appreciation and envisaging of conditions in a mine such as comes from long familiarity with work underground. Next in importance is a competent safety inspector; he preferably should be a former superintendent or manager of mines, so as to be able to exert moral authority, which is more potent than any legislative enactments or bureaucratic regulations. The Argonaut disaster already has led to more precautions against fire, and to the introduction of more system for that purpose, in the mines of California than anything the legislature at Sacramento could accomplish. The engineers of the Accident Commission and the mine operators are co-operating loyally to devise methods for safeguarding life and property—the life and the property involved in each mining enterprise. The men that died in the Argonaut have not died in vain.

DISCUSSION

Reversing Ventilating Currents During Mine Fires or Explosions

THE EDITOR:

Sir—Mr. Rickard's discussion in the *Journal-Press* of Sept. 30 and Oct. 7 and 13, as to whether or not the ventilating current of the Argonaut mine should have been reversed, also your editorial of Oct. 7, reminds me of what was done on several other occasions. The question is one concerning which there is sharp difference of opinion. Merely to make it clear that the argument is not entirely one-sided, these instances are cited.

1. In October, 1914, an explosion took place in the North mine of the Franklin Coal & Coke Co., at Royalton, Ill., by which 52 of the 357 men in the mine were killed. This mine was ventilated by a 20-ft. Sirocco fan, running as a blower. The air shaft was the downcast and the hoisting shaft (315 ft. deep) was the upcast. At the time of the explosion, the day shift had been lowered into the mine, and most of the men had reached their working places; but a number of men were waiting at the shaft bottom to receive instructions from the mine manager, J. B. Brown, who was then on top. Immediately after he saw the explosive wave of dust come up the hoisting shaft, and knowing that men were at the shaft bottom, *he had the fan reversed*, thereby saving between 80 and 90 lives. A rescue crew without apparatus was then able to enter the hoisting shaft and help those congregated at the bottom. Crews wearing oxygen breathing apparatus arrived soon after, and completed the work of rescue and recovery.

2. From reliable data on hand it is certain that in the great majority of the fires in coal mines, where the main hoisting shaft was the downcast, the fans *were not* reversed. The reason for this is because the men, in time of fires, naturally make for the main haulageway leading to the hoisting shaft, and thereby meet the fresh air; whereas, if the air current is reversed, and the men take their accustomed road, they will have smoke drawn over them.

It might be added that during a fire in the 700-ft. main shaft of the Leyden coal mine, in Colorado, in December, 1910, somebody without authority did reverse the fan, hoping to save ten men in one section of the mine, but this action did not save them, and firefighters near the fire barely escaped with their lives.

3. The fire at the North Butte copper mine in June, 1917, will be remembered. There were 410 men in the mine at the time, of whom 161 were overcome by fumes and two were burned. The system of ventilation was briefly as follows: At two shafts—the Gem and Rainbow—some distance from the main part of the mine, were two reversible Sirocco fans, running exhausting. There are two other shafts, the Speculator shaft being the upcast and the Granite Mountain, the main hoisting shaft, the downcast. At the Speculator shaft was a stand-by fan. On the 3,000 level was a motor-driven Sirocco fan for augmenting the air supply to the lower levels. A good deal of the air from three large compressors was generally used by the men to improve the air at certain faces. Fire broke out near the 2,450 level, and converted one compartment of the downcast shaft into an upcast. Immediately on learning of the fire, the general manager, Norman B. Braly, *gave orders to have the fans reversed* and the fan at the Speculator shaft started as a blower. The first fan was reversed within thirty minutes, and the second, with that at the Speculator, in a little over an hour. It was later proved that at least forty lives were saved by this prompt action, and it also allowed of the quick sealing of doors in the Granite Mountain shaft and in various other important operations.

4. On the other hand, there is an instance where the fan *was not* reversed—namely, at the Pennsylvania copper mine at Butte, in February, 1916. Fire broke out between the 800 and 1,400 levels, probably at 1,200 ft., near the downcast airshaft, when there were 220 men in the mine. The alarm was promptly given, the skips were changed to cages, and 195 men were hoisted to the surface within forty-five minutes after the outbreak; while six men escaped through the adjoining mine at the 1,000 level. Nineteen men were found suffocated on the 300, 500, 600, 800, 1,000, and 1,200 levels; but it was felt certain that there must have been a reversal of air currents some time during the fire, otherwise these men should not have been overcome. To what cause this probable reversal was due has never been fully determined.

Ventilation of this mine was effected by means of a motor-driven fan on the surface, forcing air into the workings to a depth of 1,200 ft. through an air shaft and a system of tunnels, raises, and drifts, respectively 500 and 800 ft. from the main hoisting shaft, which was the upcast. On the 1,200 level at the air shaft was another motor-driven fan, taking air from this shaft and forcing it through the workings to the 1,600 level, and partly to 1,800 ft. depth south of the main shaft; and again at 1,600 ft. there was another fan supplying all the mine below 1,800 ft. (total depth then 2,800 ft.), and between 1,600 and 1,800 ft. north of the main shaft. All of the air returned to the surface through the main shaft. A system of doors shut off the air and main shafts at each level.

During the subsequent fighting of the fire, the ventilating current *was* reversed, another fan having been installed on the surface at the air shaft. This was accomplished within fifteen hours after the fire was discovered. Also, a second fan was installed near by to be readily available in case of emergency during the fire fighting.

I offer no opinion, but simply give facts. Prompt decisions, based on a thorough knowledge of normal conditions, and what is likely to happen—not forgetting the effect that any change in the direction of the air current is likely to have upon the men—seem to be expedient in such cases. M. W. VON BERNEWITZ.

Pittsburgh, Pa.

The Relation of Gold to Currency

THE EDITOR:

Sir—Your issue of June 3 contains two articles on one of the biggest issues of the moment—the relation of gold to currency. The one alludes to proposals to eliminate the use of gold; the other to the need for the gold standard. Having during the last four years propounded, through the press and otherwise, certain views on this issue, I have been impressed with the general lack of attention that has evidently been given to it. I feel, therefore, that no excuse is needed in asking for space in your pages for comments on a few of the fundamentals, which seem to be generally misunderstood, and on a few of the main results that may flow from present policies. The issue is less vital to America than to certain other countries, her economic status being much stronger and she being in a position of comparative independence.

Gold is not, and was not before the war, the basis of credit. Commodities, including gold, form that basis. Before 1914, gold was the exchange medium and the measure of values. In some countries it is still both of these. In others it is neither; its place has been taken by paper. Mr. Ford apparently does not see that the question of using gold as currency is not a question of basis of credit, but one of having a common measure of value. His scheme therefore does not answer.

The main reason why we must use gold if we are to have an effective exchange medium and measure of value is that it is the only available medium for international trade. If a country did not (and did not want to) trade with others, a paper currency would serve its purposes sufficiently well, provided its government was reasonably honest and intelligent. Minor objections can be ignored here. But the paper of one country is valueless in another country. Its value is merely what it can purchase in its country of origin. Consideration makes it obvious, and it is now thoroughly proved in practice, that the result of using paper currencies is that there is no common measure in which the countries can express their trade with one another.

America's currency is on the gold basis, but the fact that the currencies of other trading nations are not, impedes her trade with them. The issue, therefore, is one that concerns her. To some nations, including Britain, the issue is vital and a cure is sorely needed. Where is the best cure? The *prima facie* way—of just freeing the circulation of gold—cannot be adopted. Those nations have inflated their price levels in varying degrees. Their paper has decreased in value. If their gold coins were released, no one would exchange the coins for the paper at par (face value). There would either be no gold in circulation or it would circulate with a bigger exchange value than the paper. Also, the exchange value between them would be fluctuating. The thing would function inefficiently. The objection cannot be met by withdrawing part of the paper, because that would bring about a great and sudden deflation which would have ruinous effects. Also, it would make the great national loans into burdens too heavy to be borne, as well as the means of great injustice—saddling the peoples with loads of debt greatly in excess (in real values) of what was borrowed.

The cure I have advocated is to give a new mint price to gold, such as would enable it to be freely circulated and to be reinstated as the legal tender—i.e., to restore the interchangeability of paper and gold. That this course is the best I am still satisfied. It would simply re-establish pre-war conditions (which were well proved), but on a different level of nominal values—on the nominal values of today. It would restore the exchange medium and the measure of value and would stabilize price levels. It can be effected by simple legislative action. Like most other cures, it has probably become less easy for it to do its work as time has passed and the malady become more confirmed. But that it is still the best available, I have found nothing to cause doubt.

It appears, however, that in certain influential and well-informed quarters another cure is being aimed at. This cure is based on the assumption that pre-war relations between paper and gold (in nominal value) must not be altered. The cure is based on the fact that, a great part of the pre-war market for gold (its use as currency) having been eliminated, there is promise that its accumulation will before long bring its price to pre-war parity with the pound sterling without withdrawing paper or deflating price levels. The price has lately been within 10 per cent of the said parity, and it is expected that the movement will continue. The idea is that, pre-war parity having been achieved, gold can then be restored as Britain's measure of value; that by continuing the use of paper only for internal circulation (currency), the paper can be made convertible in gold at parity for purposes of foreign trade. Thus the idea is to retain paper as the exchange medium, but to use gold as measure of value and as an exchange medium for international purposes. Some talk loosely of France, Italy, and others following suit. We are even told that they are determined to do it. It is certain that the different countries cannot all get back to the same parity by pursuing the same methods and starting from different points—where they are now. They would need to make adjustments by means of varying degrees of withdrawal of paper, with the evils of deflation mentioned above. However, we will not analyze that issue here.

So far as Britain is concerned, it seems possible that this process may bring her paper and gold to pre-war parity, and without deflation of prices. Whether it would enable an effective measure of value to be established is not certain. Close control of the paper would be necessary, and even then fluctuations might be large enough to impede trade. Space forbids discussion here. It may be proposed to establish gold also as the exchange medium internally, but to rely on appeals to the people not to use it, and, by making convertibility difficult, to keep the demand for it very small if not nil. In either case it is done by systematically reducing the demand for gold.

The idea in both this process and the one I advocate is to leave real values unaffected at present price levels. It is also to have values expressed in gold. My proposal means that they would be expressed in smaller terms of gold. I would allow gold to secure such value as a return to pre-war currency conditions would give to it. The other process would aim to have gold to secure such value as the decreased use (market) for it would give. I would reduce the value of the present sovereign by decreasing the quantity of gold in it. It would reduce the value of the sovereign by decreasing the value of gold. Both aim at the sovereign having the same value, that of the present paper pound sterling. The difference between value and price must be clearly

visualized. Value is used herein as meaning real or commodity value (purchasing power) in contradistinction to nominal value (price).

It is here that particular factors affecting America enter. Apart from her general concern in the economic stability and well-being of other countries, the issue affects her gold mines, her gold stocks, and her foreign loans. If the process succeeds in further lowering the value of gold and of fixing it permanently at a lower level, her gold mines will further decline; her gold stocks and foreign loans will decrease in value. In view of the removal of a great part of its market (currency) and of the accumulation of gold stocks, it seems the said process may so succeed. It is not certain; it will probably depend largely on whether part of the American stocks are released or not and on gold production.

Large numbers of mines are on the bread line. A further decrease in gold value will close them. The industries, Asia and other countries absorb large quantities. These factors may possibly counterbalance the others. The present point is that if, by the continued disuse of gold as currency, it is reduced to the present value of 85s. per ounce, then the described effects will appear. Further, if the process can go that far, why will it stop just there? If the movement can reach that point, in spite of America holding her large gold stocks, to what value will gold fall if America releases part of these? It seems that we would be faced with a quantity of gold in excess of what is wanted to enable the pound sterling to purchase 123 grains. This would mean either that the governments would have to carry larger stocks than necessary for the purpose of foreign trade, or would mean a decrease in gold value. It would certainly make the way easy for inflation. It being established that a certain ratio (apparently a very small one) of gold to paper enabled the new conditions to function, governments would be tempted to stretch the paper to the limit of such ratio. The history of paper currency supports this. Especially will such temptation be strong in the coming years, when most of the big nations will be pressed hard to square their budgets and will be burdened with huge loans.

The above described probable effects of the process in other countries would mean a decreased value of gold in them. The result presumably will be for more gold to drift to America and for her accumulations to increase. So long as this reservoir exists, gold apparently will maintain its present value. How far can or will this movement go? America might not care to allow the accumulating to continue. To check it, she might inflate her price levels—i.e., reduce the value of gold in America. No doubt it is the said reservoir that has held up the value of gold. But for it sterling would possibly have reached gold parity by now. America has been buying gold below pre-war value but at a value higher than would have been the case had she not taken all offering. It is indeed difficult to see, if present conditions continue, how Britain will restore pre-war parity of sterling and gold unless she deflates her currency or increases her production.

As regards foreign loans: these being payable in gold, it is now to the advantage of debtor nations that the value of gold should be low. Though the advantages that would accrue from restoration of stability in price levels would doubtless be greater, it is possible that this consideration will cause such nations to try to solve the problem by means that involve low gold value. If this be so, it would pay America to agree with her debtors that repayment be measured in commodity value—say present commodity value or a little lower being accepted. This would leave the debtor countries unaffected by any increase of gold value that might be caused by their returning to the gold basis, and thus eliminate the said obstacle to their doing so.

My information as to whether all the foreign loans are legally payable in gold is incomplete. I understand, however, that they are regarded as payable in gold. In other words the loans represent fixed quantities of gold. A point worth noting is that America, in upholding gold value by absorbing all that offers at her present price levels, is thereby preventing the real value of her foreign loans from declining and is supporting gold production.

It is impossible in a brief space to review all the probable effects of present currency policies, but I hope the foregoing will indicate some of them. It is well that all, especially those concerned in gold mining, should realize that, as regards restoration of a common uncharted and unknown waters, and, as to the future value of gold, is probably heading for the shallows.

Perth, Western Australia. H. R. SLEEMAN.

The Turk

THE EDITOR:

Sir—You are showing a partiality toward the damnable actions of the beastly Turks. I have lived in Turkey for twenty years and have studied the history of Asia Minor of the past three thousand years and also the Turkish history from the time when they started from their Mongolian homes to the fertile lands of Armenia and Anatolia. They have not left even the grass to grow under their feet; they have always destroyed everything before them and have not built anything worth while.

These facts are not the records of the Middle Ages but they have occurred every day, every hour, and every moment during the last five centuries. Most of the harem-ridden Americans and Europeans take a fancy to the Turks who hide their hideous nature under a pleasant and polite social smoke screen and thus blind their filthy and dirty character.

A conviction that the Turks are addicted to wine, women, and song is the result of my experience with the Turks in the last twenty years. They are clever enough to camouflage the simple-minded foreigners as to their prohibition habits by sticking Koran to their eyes. As a matter of fact, they drink like fish. When General Harbord saw Mustafa Kemal in 1920 at Sivas during the investigation for the U. S. Government, he was dead-drunk and could hardly talk with the American General except with yes or no. This is the same man who takes airs in championing the prohibition cause.

The Turks have not produced anything worth while and have not learned anything from western civilization but French charlatanism. They have destroyed their own big empire and will likely end in complete failure in the next ten years, as Russia will occupy the land conquered by Turks and reach as far as the Mediterranean. Then the same Christian elements, the rightful owners of the land, will develop the country for the benefit of all who desire the progress of civilization. Then the mining and railroad construction will go on in a right way without graft and corruption.

New York. JOHN R. MARDICK.

The Wilshire Gold Mine

An Account of an Unusual Type of Ore Deposit, a Bed Vein in Quartzite—Mode of Deposition of Valuable Metals and Sulphides Not Clear

By H. W. Turner

By wagon road the Wilshire gold mine is about 25 miles southwest of Laws, Inyo County, Calif., a station on the Owens Valley branch of the Southern Pacific R.R. It is situated at an altitude of about 8,500 ft. above the sea, as indicated on the mine maps, or approximately 9,000 ft., according to the U. S. Geological Survey's map of the Mount Goddard Quadrangle.

Not far west is the crest of the Sierra Nevada, the range here reaching altitudes of over 13,000 ft. On the watershed of Bishop Creek, above the mine, are a number of picturesque lakes, and these, with Bishop Creek and the snow banks of the Sierra, furnish a never-failing supply of water, which is utilized by the Southern Sierras Power Co. for the generation of

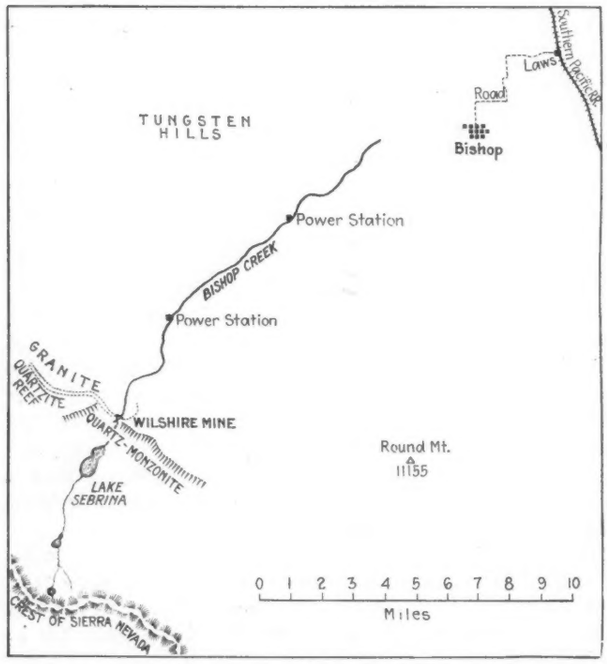


Fig. 1—Map showing location of Wilshire gold mine, Inyo County, Calif.

electric power. By virtue of water rights transferred to the power company by the mining company, the latter is furnished with 300 hp. per month free during the life of the Wilshire mine.

The mine is operated through a vertical two-compartment shaft about 300 ft. deep with levels at 185 and 285 ft. below the collar. The ore is treated by the flotation process, K. & K. machines being used, and the concentrates at present are shipped to Midvale, Utah, to the United States Smelting, Refining & Mining Co. These concentrates average above $170 per ton in gross value, containing chiefly gold, with a little silver and traces of copper. Zinc and arsenic are present, as shown by the sphalerite and arsenopyrite in the ore.

In the last run from June 28, 1921, to February, 1922, the results were as follows:

Tons wet ore milled	12,357
Gold produced, oz.	4,621
Silver produced, oz.	721
Gross value of the concentrates	$96,237
Gross value of the heads	$108,594
Gross value of the heads, wet, per ton	$8.78
Ratio of gold to silver	1 to 0.156

In this estimate gold is valued at $20.67 per oz. and silver at $1. There is generally about 1 per cent of copper in the concentrates, for which an allowance is made. The loss in the tailing averages about $1 per ton of ore.

Ore Occurs in Quartzite Reef

A geological map of the district was made by Adolph Knopf, of the U. S. Geological Survey, and published in his Professional Paper 110, treating of the Inyo Range and the eastern slope of the Sierra Nevada in Inyo County. On this map is shown a narrow reef (Fig. 2) of sedimentary rock imbedded in granitic rocks and cutting across the Middle Fork of Bishop Creek, extending thence northwesterly across the east flanks of Mount Emerson. This reef is 600 ft. more or less in width, and, in the vicinity of the Wilshire mine, is made up entirely of quartzite, dipping at steep angles of 60 deg. or more to the north, as seen in the mine workings. Nearly everywhere the reef contains some sulphides. Knopf describes the quartzite as a "coarse vitreous variety that contains a small amount of accessory garnet and finely disseminated pyrrhotite. Under the microscope they (the quartzites) show in addition small quantities of pyroxene and titanite. They have obviously been highly affected by thermal metamorphism. . . . The granitic rock west (and south) of the mine is quartz-monzonite comparatively rich in hornblende and biotite (a facies of granodiorite)."

In another publication[1] Knopf refers to the Wilshire reef as a "roof-pendant" and says:

"The largest roof-pendant in this part of the Sierra is that between the Middle and South forks of Bishop Creek. . . . It is not only the largest, but appears also to project most deeply into the granite, extending downward at least 2,500 ft. North of Middle Fork it is abruptly constricted, becoming only a few hundred feet wide, but, despite its narrowness, it persists northwestward for several thousand feet. The Bishop Creek (Wilshire) gold mine is in the constricted portion . . . and the orebody consists of a narrow band of quartzite carrying disseminated sulphides, principally pyrrhotite, but also arsenopyrite, sphalerite, chalcopyrite, pyrite, and molybdenite."

Deposit a Bed Vein

Since the date of Knopf's visit (1916?) much development work has been done, and the ore streak has been drifted on for a total distance of about 660 ft., with stoping ground for about 360 ft. of this distance. The average width of the stopes is about 13 ft., and the lode

[1]Bulletin 640 L, U.S.G.S., p. 236.

or bed vein [bedded vein] shows commercial values at many points but not continuously. To the west of the Big stope, on the second level, a strong fault was encountered, which cut off the ore. However, by drifting through the fault and crosscutting in a northerly direction, the vein was again encountered in what is known as the Peary workings. The fault has a strike of about N. 60 deg. E. and a dip to the southeast of about 55 deg. The west segment of the vein is thrown to the north about 115 ft. as measured normal to the strike of the vein (about N. 62 deg. W.). Later, a crosscut was driven on the first level, 100 ft. higher, and the Peary vein encountered and drifted on for more than 100 ft., mostly in ore of a commercial grade. The crosscut passed through the same strong fault before reaching the vein, as on the second level.

That the Wilshire reef or roof-pendant has a considerable vertical extent has already been indicated by Knopf. This suggests that the oreshoots may likewise have a considerable vertical extent. The development work done during the last year confirms this, for the drilling done nearest the surface in the Sanford tunnel, and that below the second level in the Peary ground, found commercial ore. This is illustrated in Fig. 3. which is a vertical projection showing the work just described. This projection shows that ore extends 80 ft. below the second level, and, as the Peary ore of the first level may reasonably be supposed to extend up to the good ore developed by drilling from the Sanford tunnel, there is indicated a probable vertical range of commercial ore of 420 ft. in this shoot.

Going farther west from the Sanford tunnel, the ground rises rapidly, the quartzite being well exposed about North Lake, at least 300 ft. vertically above the Sanford tunnel, so that if ore is found further west, it may have a vertical range exceeding 1,000 ft. The Wilshire reef is intersected in places by granitic dikes, and these contain some pyrite, suggesting that they were intruded before the period of mineralization. In addition, on the first level west there are narrow, dark, basaltic-looking dikes that do not appear to be mineralized and hence were probably intruded after the period of mineralization. Knopf has identified this dark dike rock as lamprophyre.

The most remarkable feature of the Wilshire vein is the fact that the commercial ore is almost wholly confined to a definite continuous layer, which to the

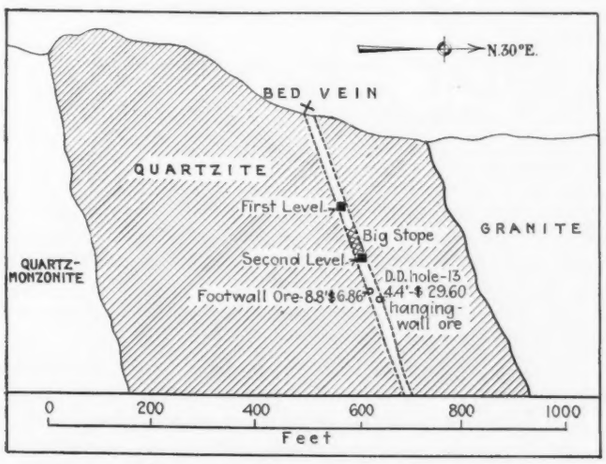


Fig. 2—Diagrammatic cross section of Wilshire quartzite reef

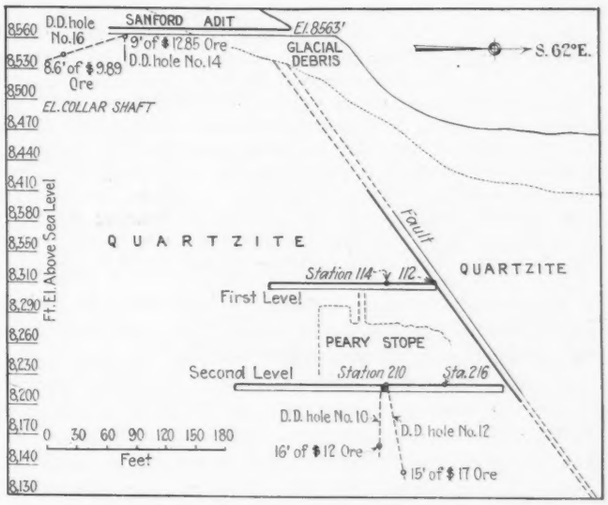


Fig. 3—Vertical projection of Wilshire bed vein

unaided eye does not differ in appearance from the wall rocks. The wall rocks, moreover, are not separated from the valuable bed vein by fractures or selvages. To determine whether or not the drift is in ore, assays are required. Thus, in sampling the Peary orebody on the second level in 10-ft. sections along the crosscut at station 210, the sample being taken normal to the strike of the ore and the bedding of the quartzite, the following results were obtained: $3.60; $3.80; $9.50; $12; $2.80. As ore of a value below $8 per ton is not at present of commercial value at the Wilshire mine, these samples indicate at this point a vein 20 ft. wide, of the value of the two higher samples, or $10.75 per ton. If, on the other hand, it later proves practicable to treat on a large scale lower-grade ore, this section might be interpreted as indicating 50 ft. of $6.34 ore. At other points an even greater thickness of low-grade material is proved by the sampling. The bedding of the quartzite is indicated by narrow bands of slightly different brownish colors, and this banding is a guide in following the trend of the bed vein. Where the rock is more crushed or broken by little slips, the bed vein is difficult to follow. Diamond drilling is in progress, with a reasonable chance of proving a large tonnage of ore.

The Wilshire lode is called a bed vein because it is a definite sedimentary layer, impregnated with valuable metals and sulphides, and not a filled fissure in the quartzite. Why the solutions should have deposited their valuable contents in this particular layer is not clear, for the quartzite layers forming the walls of the vein seem equally suitable for ore deposition. A microscopic study of the deposit will undoubtedly throw some light on the subject.

Veins of this sort, at least those of commercial value, are not common. What appears to be an exact counterpart of the Wilshire bed vein, except as to mineral contents, is the Snowstorm bed vein in Idaho as described by Ransome and Calkins.[2] The unoxidized ore of the Snowstorm contains copper sulphides with silver and a little gold.

The Snowstorm deposit is described as follows:

"The Snowstorm lode is in a zone of impregnation which embraces one or more beds of the Revett quartzite and conforms to the bedding of the rocks in which it lies. . . . There is apparently no lithological difference between the

[2]Professional Paper 62. U. S. G. S., p. 150.

quartzite that carries the ore and that which forms the country rock. Neither is there any pronounced or persistent fissuring along the lode, such as might be supposed to have determined ore deposition in its vicinity. The ore occurs impregnating the apparently unfissured quartzite, and along joints and small irregular fractures. Microscopic study shows, however, that the quartzite has been crushed and that it is traversed by a network of microscopic fractures. These capillary openings, invisible to the unaided eye, gave access to the ore-bearing solutions. The deposit as a rule has no definite walls, although the ore is locally limited by bedding planes in the quartzite."

The precious-metal deposits of California lie chiefly in sedimentary and volcanic rocks of Jurassic or greater age or in the great granodiorite batholith that underlies and intrudes these older deposits. This belt extends along the western slope of the Sierra Nevada and farther northwestward through Shasta, Siskiyou and Del Norte counties to the Pacific Ocean. The sediments and old volcanics of this series are greatly compressed, and the bedding and schistosity planes strike with the belt, and these structural features determine the trend of the ore deposits.

Deposits Occur in the Tertiary Sequences

The eastern slope of the Sierra Nevada is characterized by a great northwest-southeast series of faults along which movements have taken place in recent times. The beginning of the faulting dates back at least to late Tertiary or early Quaternary time, and is therefore recent in a geological sense. Ore deposits form along great shear planes or lines of fracture, but along many great structural faults no ore deposits of importance are known except when there has been subsequent igneous activity. Along the east slope of the Sierra in Alpine, Mono, and Inyo counties there is no such definite belt as on the west slope, but, rather, an interrupted series, and a number of these deposits have been productive. Of these, several are in pre-Tertiary rocks, as in the Masonic, Mammoth, Blind Springs, Bishop Creek, and Kearsarge districts. It is conceivable that this series is of the same age as those of the main gold belt—namely, pre-Tertiary. Others, like the deposits of Alpine County and of Bodie, are in Tertiary volcanic rocks, and hence Tertiary or post-Tertiary in age.

Traveling along the east base of the Sierras in Inyo County, one observes at many places evidence of volcanic action in Quaternary time: massive lava flows showing the irregular and contorted forms of recently congealed lava; volcanic ash beds and well preserved craters. These volcanic materials came up along the fractures of the great fault zone. Since, in most cases, mineral deposits follow rather than accompany igneous intrusions, it is likely that there are ore deposits now forming along this fault zone, and it is conceivable that some of them may be exploited and developed in the far distant future.

Bauxite Mining in British Guiana

There are many indications of a resumption of activity on the part of the Demarara Bauxite Co. about the first of the coming year, according to information from the consul at Georgetown, British Guiana, and published in *Commerce Reports*. The mines and plant have been closed down since early in 1921. Under normal conditions, about a thousand persons are employed.

Gunite in Metal Mines

The U. S. Bureau of Mines has issued a rather complete report on the use of gunite in metal mines, with tables of costs and a bibliography (*Reports of Investigations*, Serial No. 2,397; thirty pages; obtainable on request from the U. S. Bureau of Mines, Washington, D. C.). "Gunite" is a trade name for a mixture of portland cement and sand applied under pressure to surfaces with a mechanical device called a "cement gun."

The most important points which were learned from the experiments are summarized as follows:

1. The transformer house built at the Empire mine would have been better and cheaper had 15 lb. building paper, attached to studding 16 in. apart, been substituted for 1-in. plank, as the planks warped and shrunk, cracking the gunite.

2. Metal lath has only one advantage: it is more easily fitted into tight places. One-inch poultry netting for reenforcing is cheaper, and though it costs more to attach to the timbers, the finished gunite is of far better quality.

3. When there is doubt, re-enforcement should be used, even on certain rock walls and concrete dam faces; the resulting gunite is more elastic and less subject to cracking.

4. Small wire nails should be used in attaching the poultry netting to timbers, bending the heads over, as they may be used more quickly and satisfactorily than staples. The distance between nails should never exceed 12 in. The reenforcing wire netting should be rather loose. Care should be taken to insure looseness of wire on corners of square timbers, as tight wire results in cracking of the gunite.

5. Always wet timbers before guniting.

6. Always apply more than one coat. Allow each coat to set thoroughly before the next is applied. Generally speaking, the thinner the application and the greater the number of coats, the better will be the quality of the finished gunite.

7. One part of cement to three of sand (3 to 1 mixture) will answer for practically every mine job.

8. A mechanical mixer for big jobs reduces the cost.

9. The sand and cement should be mixed thoroughly before it is put into the gun.

10. In using stamp-mill sands, at least 10 per cent coarse gravel (not over ½ in.) should be added.

11. Do not use a bone-dry mixture nor a mixture with more than 10 per cent moisture.

12. Rock faces must be clean.

13. If swelling is to be prevented, fresh rock unattacked by air and moisture is essential.

14. To prevent swelling ground, all exposures should be gunited.

15. Do not use gunite in the expectation of holding crushing ground.

16. In sealing off fire areas with gunite in moving or squeezing ground, the Anaconda mines evolved the use of a burlap curtain set out from the wall, thus giving a certain amount of flexibility; it was found that if the thin gunite was applied to squeezing timbers it was not effective. Skin-to-skin timbers make the most effective bulkhead in squeezing or moving ground, with possibly the ends of the timbers gunited.

17. The more intelligent and conscientious the man who operates the nozzle, the better will be the gunite.

18. The compressed air should be dry; if wet, add a water trap or bleeder.

19. Hose joints should be tight to prevent clogging.

20. It can be readily understood that the use of forms is eliminated to a large extent.

Prohibition and the Mining Industry

Prominent Mine Operators Summarize Effects—The Two Sides to the Problem

THE EDITOR recently received a letter from Australia asking what the effects of prohibition had been on the mining industries in the United States. In order to get opinion and testimony from leading mining men in various parts of the country, the question was put before them. The following letters are among those received in reply:

Arthur Thacher, Consulting Mining Engineer, St. Louis, Mo.

As to the effect prohibition has had on the mining industry, I think this is a very difficult question to answer, as we are all naturally biased by our personal opinion of prohibition. In looking up the effects we naturally look for the ones that support our views and rather stress these. Personally, I am opposed to prohibition, as I do not believe in trying to legislate morals upon a community. If prohibition is right, and a good thing, it will naturally grow without legislative action.

Certainly we are all opposed to intemperance, and a careful study of the past will show that this has been constantly diminishing, not only among the educated classes but also among the workmen. Those of us who can look back for many years can remember the disorganization on pay day, due to drunkenness, but my own experience has been that this has been constantly diminishing and the drunkard has less and less chance of surviving.

My own experience since prohibition was attempted has probably been too limited to draw any conclusions. I say *attempted,* as I do not find that we have had prohibition, for liquor has been plentiful, although of a poorer quality and at much higher prices. Extreme cases of drunkenness have been frequent, for there was a tendency promptly to consume any liquor that could be obtained.

The advocates of prohibition claim a saving to the workman and have pointed to the increased savings bank accounts. How much of this should be credited to higher wages it is difficult to say. There are plenty of cases where the workman has spent more for liquor than prior to prohibition, due to increased cost for what he was able to obtain. In most localities there seems to be little trouble in obtaining all the liquor one desires if one is willing to pay the price and take what one can get.

George E. Collins, Consulting Mining Engineer, Denver, Colo.

As to the effect on the mining industry of the passage of the prohibition amendment, I might first remind you that, after a probationary period of one year, during which the public sale of alcoholic beverages was prohibited, but individuals were permitted to import limited quantities by obtaining a special license for each importation, "bone-dry" prohibition went into effect in Colorado on Jan. 1, 1916, long before the passage of the Eighteenth Amendment. We have therefore had a better opportunity to judge of the lasting effect of prohibition than most mining states.

Since receiving your letter I have discussed this subject with several mine foremen and leasers who themselves employ miners. Most of them consider that the loss of working time, on account of or following on intoxication, is as great as in prohibition days. I am convinced that in most mining camps moonshine liquor is freely sold, although I cannot state this on personal knowledge. Austrians and Italians import grapes by the carload, and manufacture their own wine openly. Many of these men tell me that the number of miners who drink to excess is as great as ever. My personal observation does not agree with this. My own opinion is that there is much less drinking than in pre-prohibition days, but prohibition has led to increased disrespect for law. The overwhelming majority of miners scoff at and disapprove of prohibition.

In many of the mining districts in Colorado there are stills everywhere. I believe that in many places the officers of the law are aware of the fact, and do not mind, excepting that they think the bootleggers should be brought up and fined at intervals, so as to contribute to the county or town revenues. The business of making and selling illicit liquor is immensely profitable, and is a constant source of corruption among the officers who should enforce the law. Bootlegging in its various forms is increasing rather than decreasing.

One feature which appears to me serious, and which I have not heard mentioned in the discussions on this subject, is that large numbers of people have learned to manufacture whisky, and find it so cheap and so readily made that they will probably continue making it, even if prohibition is ultimately abolished in favor of some more effective form of regulation. In other words, prohibition, while not successful in doing what it aims to do, has succeeded in creating a condition the evils of which are nearly as great as those of wide-open liquor selling, and which may be permanent.

From the standpoint of one who wishes to see the evils of alcoholic excess lessened, I therefore regard the Eighteenth Amendment with no very friendly feelings.

Charles A. Chase, Consulting Mining Engineer, Denver, Colo.

You ask of the effect of prohibition, but I presume that you have in mind the benefits or penalties to the industry from the Volstead Law, which is a fact; whereas prohibition is not a fact, by reason of the lax enforcement of the law.

Some of us in the West have had opportunities to observe prohibition as a fact prior to the Volstead Law. I saw it in Colorado, South Dakota, and New Mexico, and found the results beneficent. At Telluride the benefits were striking, as a single example will illustrate: Prior to prohibition any accident involving a

day's suspension meant disorganization for additional days before all men recuperated from the spree incident to suspension. Under prohibition we escaped the severe penalty.

Unfortunately for my value as a witness in your study, my work at Telluride has ceased, and I am deprived of opportunity to carry my observations of one enterprise into a third stage, prohibition only in name. However, I have opportunity to see the situation generally in Colorado and know that conditions are much less satisfactory for the industry than in the days of state prohibition. You will not understand from this that I believe local prohibition was better in itself; I refer to it only as a period when the prohibitory law was new and popular; when the bootlegger had not built up an organization and when prohibition was a fact.

The present condition of lax enforcement in the state at large pretty surely is of better public well-being than the days of the open saloon. As to the mining districts themselves, a smaller number of men are drinking worse liquor purveyed by a peculiarly disreputable class. The net present result in the mining districts is probably neither important gain or loss, but the bootleg business as a whole is vile enough to have in it the seeds of self-destruction.

In the light of my observations, prohibition, enforced, is beneficent, and a good mine crew can be brought to respect it. Where the mining industry is a dominant element in the community the management is in position to influence largely the degree of enforcement. Where the law is inoperative, one may expect to find management indifferent, or even hostile, and infected with the strange belief that the way to hold men on a mine is to permit them to be debauched and robbed, and left powerless to escape.

Aside from answering your question, may I offer the comment that the greatest importance of the Volstead Law, by reason of the universality of its incidence and the corresponding mirroring of the total morality and degree of respect for law, is in showing the quality of our citizenship. Whether the Volstead Law be wise is unimportant as compared with the question of the power of a minority to set aside law in other than regular ways. This is of special importance in the light of the preponderant foreign elements in many mining districts.

W. H. Blackburn, General Superintendent, Tonopah Mining Co. of Nevada, Tonopah, Nev.

At the time the prohibition amendment went into effect I really believe both operator and miner were glad of it. The miner thought he had gotten rid of a parasite that he did not like yet could not keep from supporting, due to lack of moral courage. The operator thought that he would not have to worry about the loss of a considerable number of his best men each pay day and that all of his men would be in better condition both mentally and physically.

Neither were disappointed for the first few months. The absence of liquor had a beneficial effect.

With the coming of the moonshiner and the bootlegger it can be said that prohibition has the opposite effect—that is, as prohibition is enforced at the present time. There is nearly as much drunkenness now as before prohibition, and the miner pays three times as much for an inferior grade of liquor, with its increased ill effect.

A great many other phases of the question could be discussed, but as prohibition stands today I believe that no appreciable helpful change has taken place in the mining industry.

It may be a little early to judge results. Our past experience with absolute dryness may enable us to so modify the Volstead Act that we can say that the final outcome of prohibition resulted in good to all.

James MacNaughton, Vice-President and General Manager, Calumet & Hecla Mining Co., Calumet, Mich.

As you doubtless know, Michigan became dry about a year or a year and a half before the country generally became dry, and during that time we lost a great many workmen because, as they stated, they wanted to work where they could get beer.

I have heard it reported many times that since general prohibition went into effect workmen from this district, as well as from other districts, left for their former homes in Europe. This, however, is only hearsay.

After closing the copper mines April 1, 1921, a great many of our best men left this district, and since work has been resumed they have not returned. We have always relied on the raw immigrant to do the hard underground labor. After he had done that class of work for three or four or five years, and had become accustomed to the methods and manners of the country, he aspired to something better. He became a timberman or a miner. Later on he looked for a surface job, and if he failed to get it he probably went into business or went farming.

The great majority of men do not spend more than twelve or fifteen years underground. Since the beginning of the war, however, there have been very few immigrants; indeed, not nearly enough to do the hard labor formerly done by them, with the result that it is that class of labor of which we are very short.

I do not attribute this shortage to prohibition, and yet I think if it were not for other restrictive measures prohibition would be somewhat of a deterrent.

The foreign workmen, especially the Austrians, Croatians, Hungarians, and Italians, have been used to beer and wine all their lives, and I think, generally speaking, do not care to live in a country where they cannot get them.

On the other hand, I think that since prohibition became effective we have fewer accidents and have not nearly so much lost time as formerly, nor is the turnover of men quite so great.

John C. Greenway, General Manager, Calumet & Arizona Mining Co., Warren, Ariz.

I carefully noted the effect of prohibition on our local mining industry. As a whole the effect has been good. Accidents in the mines dropped off 50 per cent almost immediately. Men had been accustomed to going into the saloons before going on shift and were careless in barring down ground in their working places as a result of these drinks; hence, the accidents. Bank deposits of our men increased in number and in amount. In times of labor disturbances the removal of liquor has undoubtedly removed the menace.

These, in brief, are the effects of prohibition on the mining industry in Bisbee.

William Kelly, General Manager, Penn Iron Mining Co., Vulcan, Mich.

The question of the effect of prohibition on the mining industry is very difficult to answer because there are so many conflicting conditions which bear upon it.

The mining community in the Lake Superior iron-ore district, in which I have lived for the last thirty years, is a thoroughly settled one. More than half the married men own their own homes. For the last ten years there have been hardly any men employed who do not live in the neighborhood or who have not formerly worked here. There have been no company boarding houses for thirty-five years. During the war the term "labor turnover" had no meaning here.

The principal nationalities represented are from the Austrian Tyrol and northern Italy, Flemish Belgians, Galician Poles, Cornish, French Canadians, Swedish, and Norwegians. Then, too, there are a number of American born and educated sons of foreign parentage. The farming country around is being taken up by the same people. The professional men are largely from older American stock. A large proportion of the Cornish and Scandinavians are total abstainers, but most of those from Central Europe have been wine and beer drinkers.

Real beer has been shut off and the substitutes do not satisfy. Wine is being made at home by a great many, as it always has been. The traffic in raw whisky is considerable. This is shown by the records of the courts and by drunken men seen on the streets and driving on the roads. The small proportion who believe the law should be observed on principle, and the moderate drinkers generally, are undoubtedly being restrained from the use of intoxicants. Those who lack control of themselves are still able to appease their appetites. Between these extremes there are doubtless many who refrain because of the absence of saloons and the character of the alcoholic beverages which can be procured.

For many years before prohibition became effective there was a gradual but very great improvement in the temperance conditions. Formerly, there were a good many who did not report for work after Sundays and holidays. More "Saints' Days" were observed, and the fraternal societies of the different nationals had picnics. But these conditions had already largely passed before Michigan went "dry." The advantages of sobriety and the penalties for drunkenness were exerting a steady influence.

When a man is away from work there is no record to show the cause of the absence. If he has been on a spree he says he has been sick. The time sheets do not show any improvement in the regularity of men working which can with certainty be attributed to prohibition, and yet it is quite reasonable to think there are individual cases where it has helped to keep men fit. Occasionally, a man attempts to go to work in an unfit condition, though very infrequently. The efficiency of work and the incentive for men to put forth their best efforts or the reverse is governed principally by the general commercial conditions, and the influence of prohibition cannot be estimated.

Individual cases are noted where men have been able to improve their financial condition, and yet storekeepers have just as much trouble as ever in keeping the accounts of their customers within proper limits. A restrictive law does not change human nature, and people who have no sense of thrift still spend their money extravagantly or recklessly, though possibly less harmfully, under the new conditions. It is hardly possible that as much money is squandered now in drink as there was in the time of the open saloons.

The methods of enforcing the law do not prevent the young people from getting alcoholic liquor. There is a widespread feeling that there is no moral obliquity in violating the prohibition laws and that the restrictions incorporated in the constitution are without binding effect.

The enforcement of prohibition is having some favorable results, but not what its advocates expected. It is still an open question whether it is the best method to advance the cause of temperance.

Arthur Notman, Superintendent Mine Department, Copper Queen Branch, Phelps Dodge Corporation, Bisbee, Ariz.

In replying to your question as to the effect of prohibition on the mining industry, I find it difficult to divorce my mind from preconceived notions as to what the effect should be. Had operating conditions been more nearly normal since the Volstead Act, or if we were further from the Mexican border, or had we not been dry in Arizona for several years prior to the federal amendment, my opinion might be more valuable.

During state prohibition prior to 1917 there was a steady improvement in the living conditions of miners' families in the district, due to the abolition of the saloon. There was very little bootlegging, and enforcement seemed to be an easy matter. In the last few years saloons have been opened in all of our border towns on the Mexican side, and in spite of the very effective state enforcement officer—probably as good a man as there is in the service—considerable smuggling has gone on across the line. I want to take this opportunity to pay my respects to Mr. M. E. Cassidy, State Prohibition Director of Arizona. I have known Mr. Cassidy for over ten years, and I am convinced that if any man can enforce prohibition he can. Even with these local difficulties, my present belief is that miners and their families here have been benefited, and that their children will have fewer temptations to combat than they would have had in the days of the open saloon.

This, also, seems to be true: The men have more leisure and are more interested in discussing the whys and wherefores of their existence. With some of them this naturally leads to greater discontent; with others, to more constructive thinking. Here, too, I believe the net result is gain rather than loss.

Strangely enough, there has been no improvement in regularity of attendance at work. So many other factors are involved that it is impossible to say that this is or is not a result of prohibition.

B. C. Yates, Superintendent, Homestake Mining Co., Lead, S. D.

I find it very difficult to express my convictions as to the effect which prohibition has had on the mining industry. During the first year or more after the saloons were closed the general effect on our employees was very good. The number of absentees from work on account of drinking decreased materially, and the general condition of the families of the workmen was improved.

On account of the unsettled condition of labor at that time it is difficult to say what the effect was upon the stability of our working force. We were short of labor at that time, and the men were constantly on the move, due, I think, largely to the effect of higher wages in other industries. During the last year the traffic and sale of what is generally termed moonshine has increased very materially in this community, and while every effort has been made to put a stop to the traffic, it is increasing, and we have a great number of cases where men appear for work intoxicated or showing the effects of heavy drinking. A great number of men lay off on account of drinking, and there seems to exist a regular system of carrying on the making and sale among the employees, some of the men finding it more profitable to stop work and make and sell moonshine than to work steady in the mine.

Personally, I have up to this time always felt favorable toward prohibiting the sale of liquors, especially in a saloon, as it was formerly conducted in this country. However, I am beginning to think that unless it is possible to prevent the manufacturing and sale of home-made whisky, it might be better to sanction the sale of light wines and beer, while prohibiting the sale of strong liquors, except possibly under direction of the Federal Government.

Prohibition, if properly enforced, would be a blessing to the mining industry and would in time bring about great blessings to the workmen in the mining industry, but if it cannot be enforced better than is now being done, some change should be brought about by reenactment of the prohibition law.

L. S. Cates, General Manager, Utah Copper Co. Salt Lake City, Utah

There is absolutely no question in my mind but that prohibition is a good thing and that it is here to stay. From a selfish operating standpoint this is reflected in better efficiency, steadier work, and less agitation; and from the employees' standpoint I have noticed a higher standard of living: They have better furniture, more of the comforts of home, and take far better care of their wives and children.

In one industry with which I am connected we have a semi-monthly pay day. Prior to prohibition you can look over production charts and determine each pay day on account of the output being reduced from 40 per cent to as high as 60 per cent. You can now look at similar charts and it is impossible to determine the pay days. In this same camp prior to prohibition, 90 per cent of the children were barefoot and very few houses were equipped with electric lights and telephones. Now the children are well kept; practically all of the houses have electric lights; over 120 telephones have been installed, and the whole general tone and aspect of the camp is tremendously improved.

I appreciate that there are some arguments that prohibition is not effective in the mining camps on account of so much moonshine and poor liquor being sold. In this I do not agree. I am willing to admit that there is a good deal of poor liquor being manufactured and sold, but it is being sold in decreasing amounts rather than increasing. Every now and then somebody dies from an overdose of bad liquor, and this has a salutary effect upon a certain number. I firmly believe that within the next ten years the drinking of moonshine will have disappeared, or practically so. I liken the prohibition movement a good deal to the practice of dueling in the past century. At one time it was quite prevalent; laws were passed for its abolishment, but it was a considerable number of years before it was actually abolished.

I do not wish you to get me wrong in the sentiments above expressed by believing that I am a teetotaler and a former prohibitionist. I voted against prohibition, but since it is with us I am frank to say that if it were on the ballot this fall I would certainly vote for it.

Stanly A. Easton, General Manager, Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho

In answer to your query as to the effect of prohibition on the mining industry, I unhesitatingly reply that I consider prohibition has been of the utmost benefit both to the industry as a whole and to the workers as individuals. I must limit this opinion to my own experience, but I feel that what is true here must be also true elsewhere, at least to some degree and possibly to a greater degree in particular instances. My position is taken because of the following:

Our county was the wettest in Idaho; the state went dry by legislative enactment Jan. 1, 1916, and a State Constitutional Amendment was voted on the following November, and, to the surprise of most of us, when the votes were counted, the county went overwhelmingly dry. After trying prohibition a few months the people liked it; although the industrial centers are generally conceded to be opposed to prohibition, such did not work out in Shoshone County.

We never were troubled seriously by drunkenness on the job. Many of our men lost much time because of drinking when off duty. I think the most serious effect on the crew was the late hours which resulted from knocking about the saloons until midnight, the closing hour, and afterward on the streets. This resulted in a loss of sleep and rest necessary for the good physical condition of underground and other workmen.

Before the saloons closed there was always more or less of a crowd in and out of our Y.M.C.A. until long after 10 o'clock. Now the crowd has disappeared and gone home to bed, as they should, before 10 o'clock. This is all for the good of the men themselves, and is bound to result in a better physical condition, in increased efficiency, and in a better mental attitude toward the world in general.

The foregoing may be construed as an argument against saloons, but not against liquor. However, I link the two together very closely, as any form of drinking, whether in saloons or elsewhere, is bound to result in late and irregular hours. Our records and the records of the county as a whole will show fewer accidents since prohibition went into effect. I think this is pretty general throughout all industries, and is due not so much to drunkenness on the job as to the fact that since prohibition the men are in better physical condition, have more and better rest, are keener and more alert, and thus take better care of themselves.

We are close to the British Columbia line, and rum-running is easy; nevertheless, the bootleggers tell me that their business is very poor—fewer men are willing to pay the price—and that they would rather spend their money on gasoline, moving pictures, and other forms of recreation. It is a question of business more than

one of morals; to bring a load of liquor in from Canada in an automobile costs money, and it cannot be peddled at pre-prohibition prices. Also, there is the risk of arrest and confiscation, which must be written off, and although men may want the liquor, they are not willing to pay the price which circumstances make necessary.

Also, the home-brew game is playing out. In former years I would receive almost weekly a bottle or two of home brew from some friend of mine who was just putting out a new batch, but I now think it is over a year since I received my last friendly bottle. I have asked these people why they have forgotten to so remember me, and have always been told that they were sick and tired of fussing and slopping around, and had stopped making home brew because it was not worth the trouble, and that they were fast forgetting that such a thing as beer or whisky ever interested them.

The foreign element will hang on to liquor longer than anyone else, and what moonshining is still going on is largely confined to this element, though many foreign workmen have returned to Europe, and probably will not come back again. There is no doubt that some of our labor shortage is due to prohibition, but I am very much of the opinion that the benefits flowing from prohibition more than offset this temporary shortage.

Our community is better ordered, no one is ever in jail any more, and we are free from the undesirable and parasitical element which populated the fifteen or more saloons formerly supported by the community. The younger generation is escaping the low moral atmosphere which resulted from these headquarters of all forms of vice, and it is surprising what a new grip on life many of the old hard-boiled alcoholics are taking. Before we went dry I was dubious of the practical effects of prohibition, and I am inclined to think that I would have voted wet if I had not observed several months of a demonstration before I had a chance to vote, but now I am unalterably for prohibition, and a vote of this county would overwhelmingly support the present dry regime. I know the big cosmopolitan seaports are always going to be more or less wet, but the small town and the agricultural sections are dry for good, and they make up the real and worth-while portion of our country.

Present Situation in Korean Mining

Cost of Operating High—Cheaper Power Desirable—Efficient Concentration by Flotation —Gold Dredging Ground Is Being Tested

By A. H. Colbran

ONLY with the greatest difficulty have the foreign-owned mines in Korea been able to continue operations in the last few years. Korea produces the greater part of Japan's gold output, and the bulk of this is obtained from the foreign-owned concessions operating under charters granted by the old Korean Government previous to its annexation by Japan. Though it has not been necessary to increase wages for labor to any appreciable extent—owing to the fact that the operators sell food supplies to their employees at cost price—the cost of mining supplies, such as explosives, steel, and especially fuel, seriously affected the profits, and some of the properties have continued operations under an actual loss. The Japanese Government seemingly made no effort to prevent or stop profiteering. In fact, the policy of the administration then existing was to uphold prices. As a consequence, in Japan proper, we find living conditions now proportionately higher, as compared with pre-war days, than in other countries. For some time American lumber and California rice have been selling in Japan at a lower price than the native products, and beer imported from Germany can be purchased for less than that brewed at home.

The installation of a large hydro-electric power plant at the Oriental Consolidated Co.'s mines, and the successful use of gas power at the French Mining Concession, afforded some relief to these properties. Such mines as had no other option than the use of coal at a high cost were indeed unfortunate. The Fushun coal field, near Mukden, in Manchuria, is one of the largest in the world, and laying down a cheap coal in Korea would confer an immense benefit to that peninsula and its people.

The mining laws are quite broad and liberal, the government royalty of 1 per cent of the production (which has been remitted for the time being to companies operating under the Japanese law) and land taxes of about 30c. per acre per annum, are not onerous. Mining claims can be held only in the names of Japanese subjects (which include Koreans), or by foreigners by incorporating under the Japanese company laws.

The average wage paid miners, including machine drill runners, is 40c., whereas coolies receive 30c. for ten hours' work. Koreans make excellent miners, and the old basis of requiring three Koreans to accomplish the work of one white miner holds good no longer. In an effort to reduce overhead expenses a consolidated working arrangement is now contemplated between two of the largest gold producers.

Combating peculiar situations has required operators to keep abreast with the most modern mining and milling practice. On the Suan Concession the recovery of copper from a very complex and variable ore by oil flotation is extremely high. Three gas-power units using charcoal gas have lately been successfully introduced at the French Mining Concession. The fuel cost for this power is approximately 1c. per hp.-hr.

During the war gold sold in China and Siberia up to a 20 per cent "premium," and the embargo placed by the Japanese Government on its export is still in force. Lately, a duty has been imposed on the import of copper to maintain the price of that metal.

Ideal conditions for gold dredging obtain, and, though only one gold dredge is in operation, that of the Chiksan Mining Co., which is handling ground averaging 10c. per cu.yd. at a profit, good results are expected from new areas which are now being tested by Japanese and foreigners.

The Japanese authorities are making an effort to increase the production of gold, and a general improvement toward the pre-war situation can be said to have already taken place.

Diamond Drilling in El Potosi Mine

Diverse Uses of the Data Gathered—Orebodies Delineated Preparatory to Mining—Description of Methods of Operation—Adequate Reports Essential to Make Information of Maximum Value—Costs

By Harlan A. Walker

DIAMOND DRILLING has been successfully carried on in the properties of the El Potosi Mining Co., in the Santa Eulalia district of Chihuahua, Mexico, for the last nineteen years. To many the diamond drill is considered as essentially an ore finder, and, to be sure, that is its ultimate object; but it has found a more varied use in this property. In addition to the proving of orebodies by penetrating them, a vast amount of valuable geological information has been obtained, which has subsequently led to the discovery of previously unknown orebodies. Moreover, drill-hole data have proved valuable in helping to determine methods of mining. At present about 3,300 ft. of drilling is done every month on the Potosi properties.

Orebodies Irregular Deposits in Limestone

The oldest known formation in the Santa Eulalia district is Cretaceous limestone, varying slightly in color from grayish white to dark bluish gray; in texture it is compact and semicrystalline. Its thickness is estimated to be from 4,000 to 20,000 ft., the only localities where vertical beds are exposed being about 120 miles distant. In that locality the exposure is not satisfactory for accurate measurement. The beds are slightly undulating throughout the camp; dips range generally from 5 to 15 deg. Directly above the beds is an irregular capping of tuffs, flows, and detrital material having a maximum known thickness of 1,200 ft. Before the capping was laid down the limestone beds underwent deep erosion and slight folding. The capping was then emplaced, and further periods of erosion followed, extending at times through the capping into the underlying limestone beds. Hence a wide range of thicknesses may be observed in the different localities of the district. A small number of andesite and rhyolite dikes traverse the area, the majority of which are later than the flows.

There are three types of ore representing successive stages of formation, all of them occurring in irregular deposits in the limestone. They are as follows:

1. Silver-bearing iron sulphide with an iron, alumina, silicate gangue.

2. Replacement deposits of silver-lead-zinc ores in chimneys of circular or elliptical form, extending from the greatest depth of known workings to the capping. These vary from 66 ft. up to 328 ft. in diameter, and have a maximum length of 656 ft. This is the most important class of deposit, for it represents the type of body from which are mined the lead-silver carbonate ores of the property.

3. Galena carrying little silver and practically no gangue. This occurs in narrow streaks along fissures, and is not economically important except in isolated occurrences, where mining has been done on the surface along fissures in the capping.

The fissure systems are of main geological importance and follow well-established courses. Consequently, an intimate knowledge of them is essential to intelligent mine exploration. The fissures are practically vertical —that is, normal to the limestone beds.

The main deposits are found on north-south fissures, the earliest known fissure systems. They occur in parallel bands approximately 328 ft. apart, and have been formed apparently along zones of weakness resulting from a series of gentle folds having north-south axes. Another important ore-bearing series strikes N. 10 deg. W. However, a number of other series have a pronounced effect upon the geology of the orebodies. They are designated by their strikes as N. 10 deg. E., N. 30 deg. E., N. 30 deg. W., N. 55 deg. E., N. 70 deg. W. and N. 75 deg. E. These are important at points of intersection with the ore-bearing fissures. For example, the N. 75 deg. E. series, upon its intersection with the north-south, has acted as a depository for solutions leached from the north-south fissures. One of the largest orebodies in the mine is formed on the intersection of the north-south, the N. 30 deg. E., and the N. 75 deg. E. fissures, the ore having been "stepped" by the N. 75 deg. E. fissure from the north-south fissure onto the N. 30 deg. E. fissure. The N. 30 deg. E. fissures are the latest, and in some instances extend through the flows to the surface. These systems are not ore-bearing in themselves, but when they intersect any main ore channels, very often some ore is encountered, and mineralization is strong.

Diamond Loss Is Low

Machine Types—There are two types of machines in use, the Sullivan Beauty machine and the E. J. Longyear UG model; each has a maximum capacity of hole of 800 ft. Core barrels and drill rods are of standard "E" type. Drilling speed in good ground varies from 50 to 100 ft. in eight hours, running at 200 to 300 revolutions per inch per minute. Compressed air is supplied with a pressure of 85 lb. per square inch at the machine.

Drill Bits.—Bits are set with ten stones, eight cutting and two clearance. Black diamonds are used in sizes ranging from ½ to 2½ carats. When it is necessary to buy clearance stones, a cheap grade is satisfactory, but for the larger cutting stones, experience has shown that the best grade is desirable. These unworn stones are started with a weight of 2 to 2½ carats, and, when once broken in, 1½- to 1¾-carat stones are obtained. These give excellent results and low diamond loss. In 12,650 ft. of hole drilled between Jan. 1 and June 15, 170 ft. of which formation was in a hard compact lead sulphide and the remainder in limestone, the diamond loss was 5.91 carats, or 0.0004692 carats loss per foot. The diamond loss is greater in sulphide ore than in carbonate ore or limestone. The bits used had an average weight of 13.5 carats, and the drilling speed averaged 47.6 ft. per shift. The diamond loss depends upon the skill exercised by the drill runner and bit setter, the character of ground penetrated, and the quality of stone used. The wear when diamonds are new is ap-

preciably greater than after they have been used for a few hundred feet. The above-stated average, however, includes the breaking in of new stones, normal wear on stones already broken in, and loss due to breakage and chipping of stones.

Setting Is a Responsible Task

The life of a bit varies according to the skill of the setter, the care taken by the runner in operation, the character of the ground drilled, the quality of the metal in the bit, and the quality of the stones. The setter must use great care in setting his diamonds to insure minimum strain on them. Some setters carefully caulk each stone with copper so that the metal is worked closely around it at all points and but little of the stone is exposed. Others set their stones without the use of any auxiliary caulking metal by drawing the metal of the bit up around the stone. This requires greater skill and care, but assures a better bit.

Bits are set to cut $\frac{13}{16}$-in. core. Clearance stones are set as closely to the face of the bit as possible, thereby acting as a protection to the cutting stones in pulling through caving ground.

Another method of bit setting, employed by a prominent firm of diamond-drill contractors, differs from that above described mainly in the position of the clearance stones, which are set 3 to 4 in. back of the cutting face, and in a swelled coupling. However, the non-use of the swelled coupling, in conjunction with the setting of the clearance stones close to the face of the bit, has, as advantages, minimum strain on stones, less hole deflection, and greater footage per bit.

A bit made of a tough special steel is the most durable. It is slower to set, as the metal is less ductile, but it is more resistant to wear. This type will average 500 to 600 ft. in ordinary ground, whereas one of common cold-rolled steel reaches its limit in 200 to 300 ft. Often, after a bit has been used for several hundred feet, a stone or two may be repinned or recaulked, after which the bit may be again used without resetting.

Starting of Holes and Deviation—As a number of holes always are drilled from a given set-up, the usual practice is to line the first hole with a transit; the succeeding holes may then be set with reference to the first by an accurately made wooden template set against rods placed in the first hole. Horizontal holes are started by carefully leveling the feed screw with a spirit level, care being taken that the rods are properly centered in the chuck. The tendency of a horizontal hole is to deflect upward, owing to the downward sag of the rods from their own weight and the clearance of the rods in the hole. This causes them to assume a slightly curved position, thereby causing the bit to work upward. This may be minimized by keeping the bit sharp; and, when changed, the new bit should be recalipered to insure its following in the partly drilled hole. Setting bits with slight clearance further reduces deflection of holes.

Deviation of Drill Holes Not Important

When a small slip or uneven rib of alternately hard and soft rock is met in such manner that cutting alternates from hard to soft formation, the tendency of the bit is to follow the lines of least resistance, and deviate into the softer rock. However, this seldom occurs. At times cherty ground is encountered, in which case a sharper bit is necessary to minimize the diversion of the hole from its intended course. The drill speed is also lowered to reduce vibration, lessen the risk of breaking stones, and increase drilling headway.

In a crosscut recently driven along the course of a horizontal hole to catch ore shown in the log of the hole at 500 ft., the crosscut was started with the hole in the center of the face, 2 ft. above the floor. Deviation to the right or left was negligible, but the hole was lost in the floor at 300 ft. This was due in part to the fact that the crosscut was purposely driven with a slight upward grade to facilitate tramming. The drift was continued on the same course as shown on the drill-hole log, and the ore was cut at the proper point. In another instance where a crosscut intersected a number of drill holes at 100 to 150 ft. from their collars, the variation from the horizontal in that distance did not exceed 2 ft.

Drilling in Bad Ground—This may mean penetrating a cavity, porous ground, or caving ground. Generally under such conditions the hole will lose the circulation of water from the pump at the drill, to the face of the bit, in consequence of its being dissipated in the openings of the rock. In drilling in porous ground, either ore or waste, where the water is lost, it is sometimes possible to stop the crevices sufficiently to resume water circulation. Horse manure, bran, oatmeal, or sawdust may be fed into the water circuit, or the crevices may be stopped with tallow. To accomplish this the hole is drilled a few inches in advance of the point at which the water first disappeared. Rods are then pulled and a tallow cartridge is moulded to fit the drill hole. This is pushed to the face. It should be longer by at least 6 in. than the distance from the end of the hole back to where the water was first lost, so that if it is jambed forward it will flare out, filling in the surrounding interstices in the formation. A third remedy is to grout the hole with cement. This is rather difficult and hardly practicable for any but steeply pitched or vertical down holes where the grouting will easily flow by gravity to its intended place. The final alternative is to pull the rods, ream the hole past where the water was first lost, and line with casing for the entire distance. This method is tedious, slow, expensive, and difficult, and wherever possible should be avoided.

"Tonging" in Bad Ground

Upon encountering caving ground, increased caution is necessary upon the part of the runner. It is sometimes possible to run through the bad ground with mechanical power, but as the strain on the rods and bit is excessive, it is usually advisable to "tong" ahead by hand. By tonging ahead is meant turning the rods ahead in the hole with Stillson wrenches. Bad ground also necessitates the use of more water than is ordinarily employed.

When a cave or fissure is struck, the rods are first tonged to determine the size of the opening, as it is not practicable to pass a width exceeding 5 ft. Almost invariably the hole must be reamed across the fissure or opening. In doing this a few inches are first drilled on the far side. The hole is then reamed to the opening, and a guide is placed on the bit so that the reamer will follow the course of the original hole on the far side of the opening. If water continues to be lost, and casing is deemed inadvisable, the hole is abandoned, and the desired information secured from another drill base. It is possible to continue drilling after determining that the water will not return, but it is unsatisfactory, as the borings are likely to clog the hole, and it

is difficult to determine the progress. Drill runners depend much upon the color and physical character of returning sludge to govern the operation of their machines in varying ground. This advantage would naturally be lost if the water did not return, and formation changes could be noted only by the recovered core and the "feel" of the machine during drilling.

In general, it may be said that whenever the machine is stopped the bit should be pulled back 2 or 3 ft. from the face to prevent its being wedged in by settled borings or other small particles. This is especially true in the driving of an angle hole. When rods have been pulled from a hole it should always be washed thoroughly just before drilling is resumed. This clears the hole of rock fragments which might otherwise interfere.

Drilling in Ore. Sampling. Pulling of Rods—The above phases of drilling are so interdependent that they may properly be discussed jointly. In the typical limestone it is unnecessary to pull rods, except for an occasional inspection of the bit, provided no unusual or broken ground is met. Practically all of the core is ground up. When ore is entered, a marked change is immediately noted in the color of the sludge. The drill speed is then lowered and the water turned off. The hole is advanced about four inches, and if the presence of ore is still noted, the drill is stopped and the hole is pumped clean as possible. The rods are then pulled, and the core barrel and bit are thoroughly cleaned. Any sample of ore found is saved for assay. The cutting trough is then cleaned, and drilling is resumed at a reduced speed. The frequency with which the rods should be pulled depends upon the character of the ore and the running condition of the machine.

As the average carbonate ore is soft and difficult to core, the rods are pulled every 2 or 3 ft. This is due partly to the fact that the particles of ore are washed away in the crevices, or are diluted by previously cut borings in the limestone. The amount of recoverable carbonate ore is usually negligible, and the sludge sample must generally be depended upon for the desired assay. A used blank bit often may be employed to advantage in sampling soft carbonate ores, as it will do the cutting just as well, and if the bit is lost by caving ground there is no loss of stones. Another method which is often advantageous is to set a blank bit with pieces of steel file instead of with diamonds. As much as 50 ft. has been drilled through bodies of carbonate ore by using a blank bit, or one set with pieces of file.

High Degree of Accuracy in Sampling

In the sampling of sulphide orebodies, the recovery of core runs as high as 95 per cent of the ore footage, and rods are pulled every 5 to 10 ft. Further, sulphide assays give values which more nearly approach the actual, principally because the sulphide ore offers higher resistance to the processes of erosion which act during drilling. Sulphide orebodies of the hard, compact type may be accurately sampled, and the metal content may be determined accurately by assays received from diamond-drill core. The sampling of orebodies with the drill will be considered later.

Whenever an orebody of considerable extent has been cut, even though the assays showed values considerably below the standard allowable for mining at a profit, it has been found, almost without exception, that, when developed, exploitation has been profitable. Therefore, it is accepted as a rule that such bodies should be thoroughly explored and developed following diamond-drill exploration. This is carried out by the usual drifts, crosscuts, and raises.

In drilling in the typical limestone formation, certain geological observations are of considerable aid to the drill runner in the determination of the proximity of ore. The observation of the sludge water as a key to the formation has already been noted. Manganese stains in the limestone are usually an indication of the nearness of ore. In addition, it is often noted that the limestone darkens in color when close to an orebody and the limestone is more broken. An example of this was a large sulphide orebody recently intercepted. The hole ran in white to bluish gray limestone for several hundred feet. At 400 ft. the core changed to a distinct blue. At 430 ft. it changed to a dark blue. At 445 ft. black limestone was caught. At 445½ ft. the log showed 1 ft. of sulphide ore, followed by 10 ft. of black limestone, which was succeeded by 20 ft. of sulphide ore at 456½ ft.

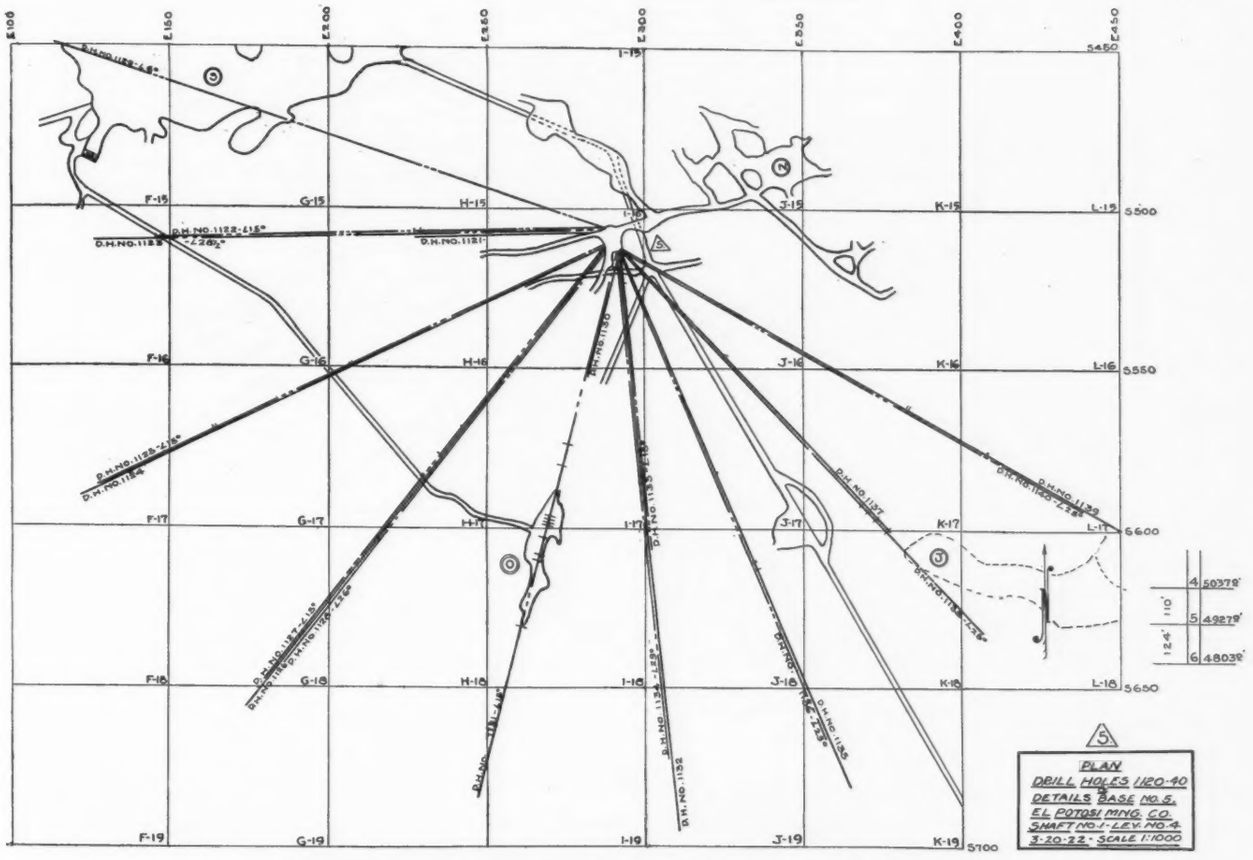
Arrangement of Drill Bases and Holes—Special drill bases are cut 15 ft. wide, about 25 ft. long, and 9 ft. high unless suitable locations are found in stopes or in other openings of sufficient size not to cramp operations. Bases are located with special reference to the section of ground to be drilled. Special consideration must be given to the geology of the block of ground to be drilled with a maximum depth of hole of 600 ft. All bad drilling ground, such as gravel, broken formation, fissure systems, caves, vugs, and the like, should be avoided. Some information of this nature may be obtained from the mine maps and from the log of previously drilled holes.

"Fanning" of Holes Has Definite Advantages

The bases should be arranged so as to drill the maximum amount of ground from one base. Holes are normally "fanned" in an east-west direction in new ground, in order to intercept the north-south systems. The holes are fanned for approximately 180 deg. with a horizontal interval of 15 deg. between holes, depending upon conditions. A downwardly inclined hole is normally drilled at an angle of 15 deg. from the horizontal below each horizontal hole. If ore is cut on both the horizontal and dip holes of sufficient extent to indicate the presence of a workable body, then the upper and lower extremes of the body must be determined.

At times holes are drilled in a general north-south direction to catch N. 70 deg. W. systems. When a set of holes has been drilled from a given horizon, the ground covered by these holes should be cross-drilled from the next higher or next lower horizon or both. In locating bases and holes on a level not previously drilled, they should be so placed that the holes will finger between ground drilled on other levels. This is termed staggering, and is so carried out that not more than 100 ft. of ground intervenes between holes on different levels.

A cursory examination of plats showing bases with holes fanned out from them (see general plat) would naturally lead to the query as to why so many holes are drilled from one point, when oftentimes the same country could be drilled from individual points with lesser footage. There are several reasons for this: First, because bases are of special size and location, and are always out of the way of tramming and mining operations. Second, because it takes time and money to change set-ups of the machine, and the slight footage saved by a new location farther along in a working



General plat showing "fanning" of holes from a drill base

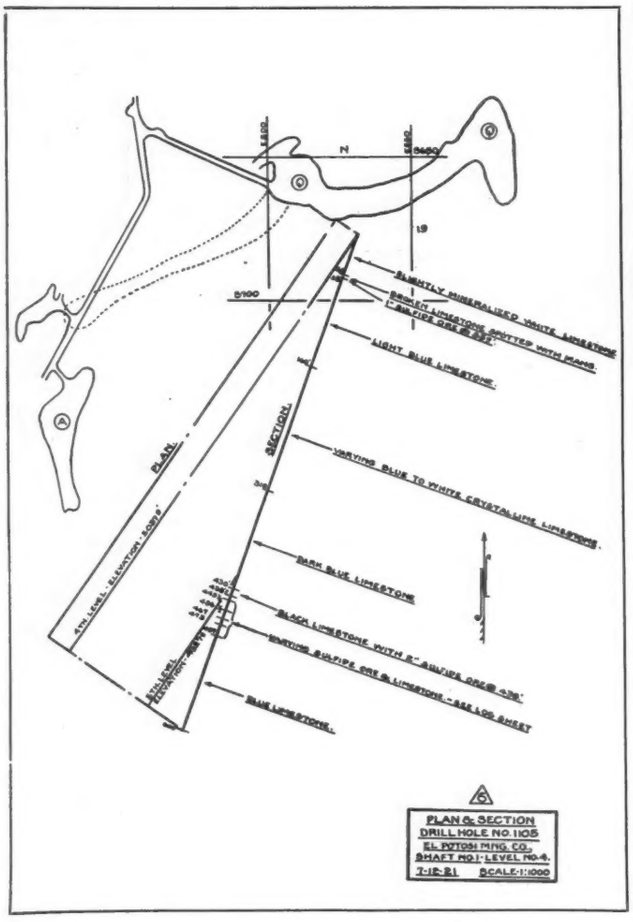
would be more than offset by the expense of moving, loss of drilling time during the change, transfer of air lines, construction of new pump, and the like.

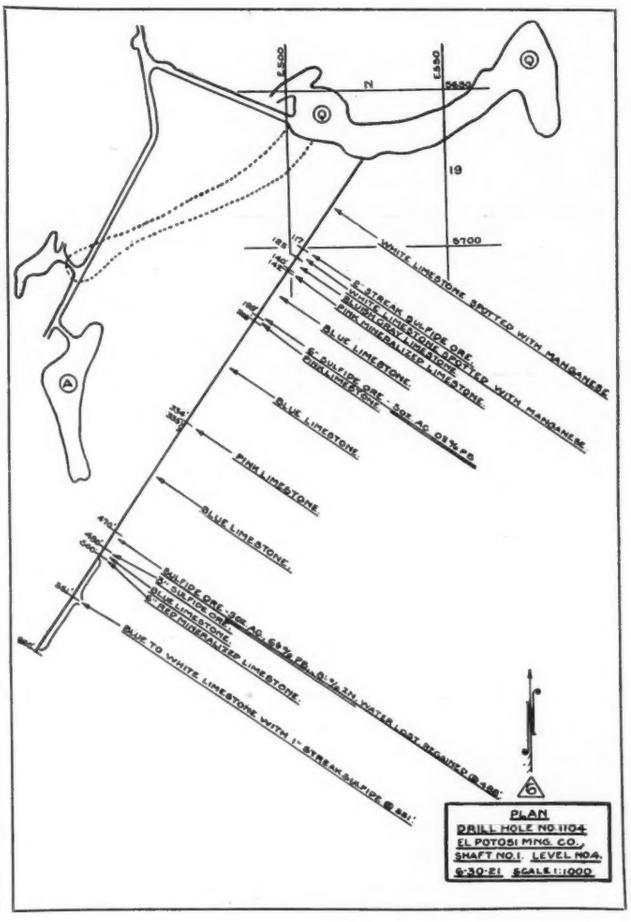
Surveying Holes—As previously stated, the deviation of holes in this formation is so slight that it is unnecessary to carry out any special method of surveying, such as the hydrofluoric acid method, the compass and gelatin method, and others. Courses are obtained by getting the alignment of the holes from rods centered in the chuck and projected to the face of the holes. About 20 ft. of rod is allowed to project from the collar of the hole, and points are carefully located at each end with a transit. Co-ordinates of the collar of the hole, elevation of the collar, and directions are then obtained from these data. Dips are usually obtained with a Brunton pocket transit, several readings being made between the collar of the hole and the feed screw, as this is the point of minimum rod sag. When completed, each hole is plugged and plainly tagged with a small copper washer carrying the number of the hole.

Drilling as a Guide to Mining Methods—The limestone formation in the El Potosi property is such that a form of underhand stoping is employed without the use of any timber whatever to support the back. This necessitates starting mining operations at the top of the body, and great care must be exercised in thoroughly cleaning from the back of the stope any loose boulders or doubtful slabs. In fact, the roof is cleaned so that it assumes an arched shape, this having proved the safest manner in which to handle it. Unsupported stopes 125 ft. wide are not uncommon, and one stope has a vertical height of 250 ft., a width of 150 ft., and length of 700 ft., entirely without timber support.

In view of the importance of the determination of the top of the orebody before stoping operations may be intelligently started, the diamond drill has attained a new function, as drilling is both economical and fast in comparison with the old-fashioned and haphazard way of exploration with drifts, crosscuts, and raises. After a drill log has shown the location of the top of a body, the usual drifts, crosscuts, and raises essential for its final development may be located most advantageously from the standpoint of economy in subsequent mining operations. This may be shown clearly by an example:

In drilling through virgin ground, 20 ft. of sulphide ore was cut in a horizontal hole. A 15-deg. down hole was then run, and 30 ft. of ore was penetrated on the dip. Other holes fanned to the right and left established the dip, lateral extent, and strike of the body. There yet remained to be determined its upper and lower boundaries. Consequently, a 30-deg. down hole was drilled below the 15-deg. hole which had caught ore. This hole failed to bottom on the ore and showed broken limestone, with no trace of ore. A 20-deg. down hole was then drilled, and the bottom boundary of the body was thus determined. In a body having considerable depth it would have been necessary to find its lower boundary from another horizon. To explore the top of the body, drifts, crosscuts, and raises were first driven. As the raises continued strong in ore until poor ventilation made it impracticable to proceed further, the block was drilled from higher levels, and its vertical height was determined. Thereafter, stoping operations could be started with facility. At no time are "up-angle" holes employed to ascertain the upward





EL POTOSI MINING COMPANY

DIAMOND DRILL HOLE LOG

July 12th 1921.

SHAFT NO. 1 LEVEL NO. 4 DRILL BASE NO. 6
COLLAR COORD. LAT. S671.90 M^TS. DEPT. E525.30 M^TS. HOLE NO. 1105
COLLAR ELEVATION 5037.25 FT. DIRECTION S359°07'W BLOCK NO. K-19
DIP 15 ° NAT SIN 0.259 NAT COS 0.966

FEET	Class of Sample	Silver Ozs.	Lead %								REMARKS
0-50	Lime.										Slightly mineralized white.
50-53	Lime.										Broken, spotted with manganese & 1" streak sulf. ore at 53'. No sample.
53-160	Lime.										Light blue.
160-310	Lime.										Varying blue to white crystalline.
310-430	Lime.										Dark blue.
430-445½	Lime	7.0	5.0	1.0	(Core)						Black with 2" sulf. ore.
445½-456½	Lime.	11.0	7.2	1.8	(Core)						Lime and ore mixed.
	Ore.	16.0	13.1	9.7	(Sludge)						
456½-467	Ore.	18.0	15.8	6.9	(Core)						Sulfide.
		34.0	19.9	9.4	(Sludge)						
467-477½	Ore & Lime.	10.0	7.1	9.8	(Core)						Sulfide mixed ore and limestone.
		14.0	6.3	4.7	(Sludge)						
477½-487½	Ore.	9.0	5.0	4.2	(Sludge)						Sulfide mixed with blue limestone.
487½-600	Lime.										Blue.

EL POTOSI MINING COMPANY

DIAMOND DRILL HOLE LOG

June 30th 1921

SHAFT NO. 1 LEVEL NO. 4 DRILL BASE NO. 6
COLLAR COORD. LAT. S671.90 M^TS. DEPT. E525.30 M^TS. HOLE NO. 1104
COLLAR ELEVATION 5038.0 FT. DIRECTION S350°07'W BLOCK NO. N-19
DIP Flat ° NAT SIN -- NAT COS

FEET	Class of Sample	Silver Ozs.	Lead %	Zinc %							REMARKS
0-125	Lime.										White spotted with mang. & 2" streak sulfide ore at 117'. No sample.
125-140	Lime.										Bluish gray.
140-142	Lime.	1.0	0.1	0.4							Pink mineralized.
142-199	Lime.										Blue.
199-206	Lime										
	Ore	5.0	0.2	(Core sample)							Pink with 6" sulfide ore at 199'.
206-470	Lime.										Blue, with 1½' pink at 334'
470-490.	Ore.	9.0	6.6	8.1							Sulfide, impregnated with iron. Water lost. Regained at 488'.
490------	Ore.			(No sample)							4" sulfide.
490-500	Lime.										Blue, with 6" red mineralized limestone at 500'.
500½-620	Lime.										Blue to white with 1" sulfide ore at 551'.

Typical drill logs and corresponding maps

trend of a body, as they are impracticable from an operating standpoint.

By employing similar methods, extensions of orebodies may be proved. This may be illustrated by the plat of the drill base accompanying this article. This base, located on level 4, cuts the ground to the south and east of El Potosi shaft No. 1. Hole No. 1,131 proves the upward extension of the "O" orebody above the 6th level, and holes 1,135 and 1,137 show the probable continuation of the "J" orebody. Hole No. 1,129 was drilled to cut over some of the old workings on level 5.

Mexicans Learn to Operate Drill

Labor—For a number of years all drill runners were Americans; at the present time all drill operations are supervised by an American. He is a salaried employee of the company, and his duties in the main consist of setting bits, inspecting the machines, and overseeing the work of the runners. Drill runners and helpers are Mexicans trained by the company. Runners and helpers work on a contract basis, the runner receiving 8½c. gold per foot drilled, and the helper 5½c. The runner is guaranteed a minimum of $2.37½ and the helper a minimum of $1.85 per shift. Contractors are paid wages for the actual time required for changing set-ups at the same base or in changing bases, at their minimum guaranteed shift rate. They can average 45 ft. per shift in typical limestone, and under good conditions can drill 100 to 110 ft. in eight hours.

Reports—The reports covering the drill work are as follows:

1. Drill runner's shift report.
2. Engineer's report—diamond-drill hole log.
3. Report on drill base.
4. Superintendent's diamond-drill hole report.
5. Monthly cost report.
6. Annual cost report.

An example of a drill runner's shift report is given and is self-explanatory. Under "remarks" are made any special notations, such as water lost, rods pulled, bad air, caving ground, and the like.

Hole No. 1106 Sto. Domingo, July 26, 1921

EL POTOSI MINING CO.

DRILL RUNNER'S REPORT

Day x
Night —

Ore encountered at	415 ft.	Terminating at	423 ft.
Commencing at	415 ft.	To	422 ft.
Ore encountered at	— ft.	To	— ft.
Ore encountered at	— ft.	To	— ft

Remarks:
Rods pulled twice.
Pump repacked.

[Signature]

Drill Runner.

Two typical drill-hole logs and the corresponding engineers' reports are shown in the accompanying illustrations. They give all geological observations, footage, engineering data, and plats. To facilitate their compilation, all drill samples are turned into the mine office at the end of each shift. They are then properly classified, special care being taken to note all changes in formation. Often there are changes in the characteristics of core samples which may appear insignificant when classified, but upon correlation with other data show facts of importance. Representative samples of each shift's run are tagged and filed away in a core tray. When the hole is completed and has been logged, the samples are filed in envelopes, in sections representing 150 ft. of hole. These envelopes show the data of completion of the hole, a copy of the log of that section of the hole, the number of the drill base, and the shaft number.

After core samples of ore are carefully classified, and a piece is saved for the files, the remainder is tagged and sent to the assayer. Core and sludge samples are assayed separately. Almost invariably core assays are higher than sludge assays, as there is a tendency for the heavier particles of the sludge to settle to the bottom

EL POTOSI MINING COMPANY
DIAMOND DRILL HOLE REPORT

DRILL BASE NO. 0 SHAFT NO. 1 LEVEL NO. 4 HOLE NO. 1105

DATE		FEET DRILLED PER SHIFT	Total per Day	LIME	ORE	DATE June		FEET DRILLED PER SHIFT	Total per Day	LIME	ORE
	D					30	D	2			
	N					30	N	38	40	40	
	D					July	D	60			
	N					1	N	60	120	120	
	D					2	D	50			
	N					2	N	50	100	100	
	D					4	D	50			
	N					4	N	40	90	90	
	D					5	D	45			
	N					5	N	35	80	79½	½
	D					6	D	26½			
	N					6	N	10½	37	20	17
	D					8	D	9			
	N					8	N	11½	20½		20½
	D					9	D	32½			
	N					9	N	20	52½	52½	
	D					11	D	35			
	N					11	N	3½	38½	38½	
	D					12	D	10			
	N					12	N	11½	21½	21½	
	D						D				
	N						N				
	D						D				
	N						N				
Totals								600	600	562	38

BIT REPORT

Bit No.	Wt. Kts Out	Wt. Kts In	Loss Kts
1105	10.69	9.75	0.94
TOTALS			

Total Supply Cost $8.08

Total Labor Cost $82.50(U.S. currency)

REMARKS:

Bit No. 1105 drilled 600 feet.

Report for an individual hole

of the hole rather than to be carried out by the water to the settling trough. Duplicate pulps of core and sludge are filed for future reference. As a rule, samples are assayed for silver, lead, and zinc, but complete assays are sometimes made of the metals and constituents indicated on the drill-hole log.

Logs of holes are dated on the day of the completion of the hole and are numbered according to the distance of the drill bases in hundreds of feet below the shaft collar. This is due to the fact that there are several working shafts, and levels carrying the same number in the different shafts are not always on the same horizon. For example: Level 4 of shaft 1 is approximately 1,100 ft. below the collar, and the first hole drilled on level 4 is 1,101. On level 5, shaft 1, the distance below the collar is about 1,200 ft., and the first hole drilled on this level is 1,201. Thus the numbers as arranged give a key to the horizon on which the base is located.

Plats show the plan of the hole if it is horizontal, and both plan and section if the hole dips. Workings adjacent to the drill on the same horizon, in conjunction with workings on other horizons of significance to the holes being drilled, are shown. Sections carry collar

elevation of holes, elevation of bottom of holes, and elevations of any level intercepted. The report on the drill base is a résumé of the work accomplished by that base, and includes the following specific data: Drill-base number, shaft number, level number, block number, hole numbers, footage drilled, types of holes (whether flat or angle), and assays. A statement is then made as to what blocks of ground have been drilled, followed by a résumé of the main facts discovered by each hole, such as assays of ore penetrated, open fissures located, broken ground intercepted, and other significant data. This report is accompanied by a plat giving a plan view of the base and all workings having any relation to the holes drilled.

The report is concluded by general geological comments on the entire base, recommendations for further work on the ground either by drilling or mine development, and also comment upon the future possibilities of the ground.

The superintendent's diamond-drill hole report, a sample of which is shown, gives daily progress of the hole, with a general classification of the formation, whether limestone or ore. The bottom of the sheet shows data pertaining to the diamond loss in carats for the hole, and the number of feet drilled by one bit is shown under "Remarks." Broken or lost stones are also noted under this head. The report is concluded with the cost of supplies and labor. It is forwarded to the general office and forms a part of the data necessary for making up the monthly cost sheet.

On the monthly cost sheet expense is distributed as "Labor," "Supplies," and "Carbon"; it is condensed in the monthly cost sheet under the general heads of "Operation," "Overhead," and "Repairs."

The annual cost report shows the financial record of drill operations for the fiscal year, and includes the average cost per foot of drilling during the period which it covers.

Probably in no other mine has the diamond drill proved its worth as it has in the El Potosi and affiliated properties. The extensive orebodies and ample reserves are credited in great part, either directly or indirectly, to the diamond drill. From the facts and illustrations brought out in the preceding pages it is clearly evident that the rôle played by the diamond drill in mining operations is broad and varied. At one time it is used as an ore finder; at another to block out or sample a given body; again, to explore the extent of fissure systems, and gather geological information; and, finally, to clarify methods of mining a given body. Through an intelligent interpretation of the data it supplies, broad conceptions may be formed which are invaluable in the correlation and the scientific mining of the immense bodies. When one considers the work that the drill has performed in the past, it is only logical to assume that new refinements will appear in the future further to increase the potential value of this great exploring agent.

Iron-Ore Deposit Discovered in Malaya

A new and valuable deposit of iron ore has just been discovered near Ipoh, in the Federated Malay State of Perak, according to *Commerce Reports*. The report shows that there are between five and six million tons available between the surface and 100 ft. below. Smelting and transport difficulties are not insurmountable. It is probable that this ore will find a ready market in Singapore.

Robert Sticht

SPECIAL CORRESPONDENCE

The name of the late Robert Sticht, general manager of the Mount Lyell Mining & Railway Co., of Tasmania, was familiar throughout the world as that of a distinguished mining and metallurgical scientist. Mr. Sticht went from the United States to Tasmania, where he was associated with Mount Lyell from the time its resources began to be developed by the company. After an examination of the huge pyritic mass there, he declared that he had never seen a deposit of ore that so lent itself to true pyritic smelting. In 1894 he began acting as metallurgist in charge of the company's treatment operations, and from then to the time of his death, on April 29, 1922, achieved a world-wide reputation for his success in the treatment of the high-sulphide ores with a minimum of fuel. Much of this work was of a pioneer nature, for, although the ore was naturally adapted to the pyritic process, little was known as to the correct height of ore column, pressure and volume of blast, amount of free silica essential in the charge, and other factors necessary for the best operation. To Mr. Sticht is due much of the credit for the discussion of pyritic smelting which appeared in Dr. Peters' books on the principles and practice of copper smelting. In recent years Mr. Sticht made two trips to the United States, chiefly to study the electrolytic treatment of lead-zinc ores. Mr. Sticht took the deepest interest in general science, literature, and art. His library was one of the finest private collections in the commonwealth.

Costs at the McIntyre Porcupine Mines

The McIntyre Porcupine Mines Co., situated in Schumacher, Ont., gives the following milling record and operating costs for the year ending June 30, 1922, in its 500-ton cyanide plant:

MILLING RECORD

Tons milled	193,971
Value per ton	$10.69
Gross value	$2,074,088.40
Production	$1,937,105.07
Per ton milled	9.99
Tailing	136,983.33
Per ton milled	0.70
Extraction	93.4
Running hours	8,377
Time in per cent	95.9

ANALYSIS OF MINING COSTS—PER TON MILLED

	Cost per Ton
Labor	$1.61
Explosives	.46
Supplies	.19
Power	.22
Workshops	.08
Hoisting	.52
Timbering	.30
Rock-drill maintenance	.11
Sharpening steel	.09
Pumping and ventilating	.11
Assaying and sampling	.08
Superintendence	.04
Surveying and engineering	.07
	$3.88
Exploration	.08
	$3.96
Examination of prospects	.02
	$3.98
Exploration	.08
Development	1.43
Breaking and stoping	2.45
Examination of prospects	.02
	$3.98
Crushing and transportation of ore	.21
Milling	1.03
Heating and maintenance, buildings and camps	.16
Employees' insurance and welfare	.16
Management and general expense mine office	.35
Administrative and general expense, head office	.44
Insurance—general	.08
	$6.42

CONSULTATION

The Greatest Mining Enterprises

"Can you kindly give us the names of the five greatest engineering projects now under way throughout the world and a brief description of each? If you can conveniently give us such information it will be greatly appreciated."

As this inquiry covers a scope larger than the field which we serve, we shall only give a list of those projects particularly related to metal mining, and leave to authorities in other fields a selection of projects with which they are more familiar than we are. It is exceedingly hazardous to give a list of names whose selection can readily become a subject of controversy, but the following enterprises are among the world's greatest mining activities, great not only with regard to size of operation but also with respect to the particular difficulties that had to be overcome in each enterprise. We have chosen six rather than five, of which one selection covers a group of mines, and shall permit the reader to exercise his own judgment in picking out the five which he thinks are the greatest:

The Utah Copper Co., in Bingham Canyon, Utah, a gigantic copper mine operated by steam shovels and one of the most successful copper mines in the world, despite the fact that the copper content of the ore runs generally less than 20 lb. per ton.

The Chile Copper Co., whose operations are at Chuquicamata, Chile. Another gigantic low-grade copper mine worked on a huge scale, and which successfully employs leaching of the ore.

Sulphur mining in Louisiana and Texas, remarkable for the unique method of recovering the sulphur from great depths—the Frasch process. Superheated steam is forced in pipes leading to the sulphur deposit, the sulphur is melted and is pumped to the surface.

The iron mines on the eastern Mesabi Range, which are open-pit operations, the largest in the world.

The copper mines of the Union Minière du Haut Katanga, which are developed in the heart of Africa, where many unusual difficulties were encountered.

The gold mines of the Rand, in South Africa, may also be classed as among the world's foremost mining operations. Not only is mining done from great depths, 5,000 to 7,000 ft. below the surface, but labor conditions and metallurgical problems have been troublesome.

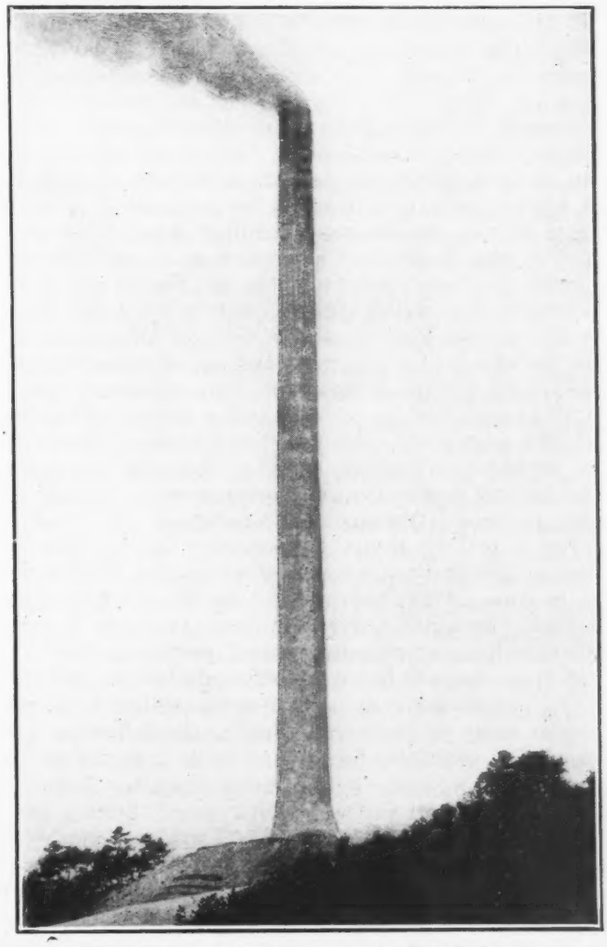
The Tallest Stack in the World

"In my last number of the *Journal-Press*, dated Aug. 19, which I have just received, there is a photo on the front cover of 'Anaconda's Big Stack—the Tallest in the World.'

"I have lately visited the Saganoseki Smelting Works, belonging to the well-known Kuhara Mining Co., and I inclose a picture showing the stack at these works.

"As the Saganoseki stack, which is 550 ft. high and has a diameter at the top of 27.5 ft., is the tallest in Japan, I am very curious to know how this compares with the Anaconda stack in height. I would be greatly obliged if you could kindly give me the height and diameter at the top of the Anaconda stack."

To anyone unfamiliar with the comparative measurements of the Anaconda and the Saganoseki stacks the Japanese stack appears much taller, an illusion created by its more slender construction. However, the Anaconda Copper Mining Co.'s stack as shown on the cover of our issue of Aug. 19 is, so far as we know, and as stated there, the largest in the world. This stack discharges the flue gases after they have been through the Cottrell precipitators and is built of perforated brick laid in acid-resisting mortar, and it has numerous built-in bands of heavy reinforcing steel. This stack is 585 ft. high, or 35 ft. taller than the Saganeseki stack, and has an inside diameter of 75 ft. at the bottom, and 60 ft. at the top, with walls varying from 6 ft. 6 in. at the base to 2 ft. in thickness at the top. The stack rests on a massive concrete foundation, and is a landmark for miles around. An interesting feature of its construction is the fact that the brick was made of old Anaconda mill tailings. The stack is capable of discharging three or four million cubic feet of gas per minute, and replaced an older stack which was 300 ft. high. Perhaps you had in mind the dimensions of this older stack when you made your comparison.



The Saganoseki stack, the tallest in Japan

USEFUL OPERATING IDEAS

Determining Proper Mine Locomotive for Specific Service

Factors To Be Considered in Making Selection of Equipment of Both Storage-Battery and Trolley Types

BY GRAHAM BRIGHT

IN the last decade, many factors have influenced the increasing demand for electrical haulage equipment for mines. The necessity for reduced mining costs, the striving for increased tonnage, the improvements in electric motors and locomotives, the increase in number and capacity of power lines, and a better understanding of the advantages and savings obtainable by the use of electric power—all are partly responsible for the general adoption of electric mine locomotives for underground haulage.

A great variety of mine locomotives are now available, involving many new features advantageous to the user from the standpoint of simplicity, accessibility and maintenance. They may be divided, however, into two general types—namely, trolley and battery. To the uninitiated, there is a sort of fatal simplicity about the latter type; as the fact that it carries its power on its back, so to speak, eliminates the necessity for any form of a trolley system and makes it seem desirable for many applications where careful analysis shows it to be impracticable. As an illustration of this, an incident might be cited of an inquiry received for a storage-battery locomotive for yard service. Complete service details was submitted with the inquiry, and it was found that a locomotive of not less than twenty-five tons' weight would be required. As an alternative, a trolley-type locomotive could be offered weighing only eight tons at a price of about one-third of the storage-battery type and more desirable from all-around service standpoint. This apparent discrepancy is explained by the fact that a certain percentage of the power in a storage battery on a locomotive is expended in pulling itself around, and the larger the battery necessary, the more power is required for this purpose. Obviously, under certain conditions so large a battery would be necessary as to make its weight and cost entirely out of proportion to the work to be done. This illustration shows clearly that seldom are any two locomotive requirements the same and that all conditions surrounding actual operation should be carefully analyzed before recommendations are made.

To choose correctly a locomotive suited to a particular mine or industrial service, the following data should be available, for each item is a factor in the problem:

Weight of empty car.
Weight of loaded car.
Number of cars per trip (average and maximum).
Average length of round trip.
Number of trips per day.
Hours worked per day.
Maximum grade and its length in favor of or against load.
Average grade in favor of or against load.
Gage of track.
Minimum curvature of track.
Weight of rail.
Power available.
Limiting dimensions.

The locomotive weight required by the worst grade conditions should first be determined. This may be found by the formula:

$$W = \frac{L(R + G)}{20P - G}$$

where W is the required weight of the locomotive in tons, L is the weight of the trailing load in tons, R is the frictional resistance of the load in pounds per ton, G is the grade resistance in pounds per ton, and P is percentage of adhesion.

R is determined by the type and weight of car, the kind of bearings, and the condition of track. Where test values of the particular car are not available, it is customary to assume 30 lb. per ton for mine cars up to three tons' capacity; 15 to 20 lb. per ton for larger mine cars; and 7 to 10 lb. per ton for standard freight cars. With roller bearings the resistance of mine cars can be assumed at 15 to 20 lb. per ton. G is twenty times the per cent grade. When there are curves, the resistance can be estimated at 0.5 to 1 lb. per ton per degree of curvature, depending on the wheelbase of the car. Curve resistance may usually be neglected in mine applications, as the curve is usually much shorter than the train. The value of P is 20 for cast-iron wheels and 25 for steel-tread wheels.

Where the grade is in favor of the load, the locomotive weight required to hold the train on the down grade may be the determining factor. In this case, the curve resistance is neglected. The formula then becomes

$$W = \frac{L(G - R)}{20P - G}$$

As a matter of safety for braking, P should be taken at 18 for cast-iron wheels and 20 for steel.

Where grades are light, the weight of locomotive required to accelerate the train may be the determining factor. This is obtained from the formula

$$W = \frac{L(R + G + C + A)}{20P - (G + C + A)}$$

where A is accelerating resistance. This is usually taken as 100 lb. per ton for acceleration at the rate of one mile per hour per second, and the rate of acceleration required in mining service is 0.1 to 0.2 miles per second, making A equal 10 to 20. The value of P during acceleration may be taken as 25 for cast-iron wheels or 30 for steel-tread wheels. It will be apparent that, where G is large with respect to A, the increase in allowance adhesion during acceleration will more than compensate for the inclusion of A, so that acceleration need be considered only where grades are light.

The weight of the locomotive should be checked with the weight of the rail, and, for good operating conditions, the figure expressing the weight of the rail in pounds per yard should be approximately three times that expressing the rate of a two-axle locomotive in tons.

When the weight of the locomotive has been determined, the motor capacity should be checked against the service. In haulage service it is desirable to check the root-mean-square current against the continuous rating of the motors.

The ability of the motor equipment to perform the service required of the locomotive, without overheating, really depends on the continuous capacity of the motors at the average voltage applied to the motors. This average is 50 to 80 per cent of the line voltage, as the motors are connected across the line without resistance in series a part of the time only. Since mine motors are rated on a nominal basis of one hour at normal voltage, the continuous rating must be secured to specify the adequate motor capacity.

It is the usual practice to equip locomotives with motors large enough so that the hour-rating will not be exceeded at the rated drawbar pull of the locomotive.

$$HP = \frac{TE \times MPH}{375}$$

where HP is the horsepower at the wheel and TE is tractive effort in pounds at the wheel. $TE = DBP =$ locomotive friction (which is assumed at 1 per cent or 20 T pounds), where T is the locomotive weight in tons. $TE = DBP + 20\,T$, or as DBP with steel tread wheels is 25 per cent of the locomotive weight, of 500 T (lb.), $TE = 520\,T$ (lb.). As mine motors are rated at the armature shaft, to get the motor horsepower required, add the gear loss to obtain the horsepower at the wheel. Assuming a heat loss of 5 per cent and substituting

$$HP = \frac{520\,T \times MPH}{0.95 \times 375} \quad \text{or}$$

$$\frac{HP}{T} = 1.46\,Mph \quad \text{or}$$

$$HP \text{ per ton per } MPH = 1.46$$

If the horsepower per ton per MPH is 1.5, the hour-rating of the motor will not be exceeded at the rated drawbar pull of the locomotive. As the maximum adhesion on starting is approximately 33 per cent, the maximum drawbar pull which the locomotive can exert will be approximately this same percentage above the rated drawbar pull of 25 per cent. This corresponds to an increase of 25 per cent in motor current above that at the rated drawbar pull. Since modern mine motors will stand overloads of 100 per cent or more during acceleration without injury, the horsepower per MPH might be considerably below 1.5 without affecting the ability of the motors to slip the wheels without injuring the motor. However, with the usual inherent low ratio of continuous capacity to hour-rating, it is desirable to have the horsepower per ton per MPH 1.5 to insure a motor with sufficient continuous capacity for the service expected from a mine locomotive.

The standard motor equipment on haulage locomotives has sufficient continuous capacity to perform practically any service required of a locomotive of the weight involved. Where exceptionally severe service conditions indicate that additional capacity is required, this can be obtained by the use of ventilated housings on the motor, or forced ventilation on the locomotive. This method of increasing the capacity is preferable to increasing the size of the motor.

In storage-battery locomotive applications it will usually be found that the battery capacity rather than the weight is the determining factor. More accurate data as to service are required to select a battery for a battery locomotive than to select the proper equipment for a trolley locomotive. The battery capacity can be roughly determined from the formula:

Watt-hours = tractive effort $\times$ 172 $\times$ distance,

where distance is given in thousands of feet. The tractive effort required on the various sections of the run should be figured separately and the watt-hours added. The sum will determine the capacity of battery required. A more accurate check can of course be made by the use of motor curves, but the formula gives a first approximation and is usually as accurate as the data on which it is based. The weight of the locomotive required to mount a battery of the proper capacity is usually greater than that required from the standpoint of adhesion.

Storage-battery locomotives are rated at 1,000, 2,000 and 3,000 lb. drawbar pull for the 6,000, 8,000 and 10,000-lb. chassis respectively at a speed of three and one-half miles per hour. The chassis weight does not include the battery, so that the total weight of the complete locomotives will be about four, six, and eight tons.

The motors have a one-hour rating equal to, or greater than, the nominal rating of the locomotive. Though the horsepower per ton per MPH is less than on trolley locomotives, the motors will slip the wheels without injury to the motor. The motors have a high continuous capacity with respect to the hour-rating, and the motor capacity is greater than the battery capacity, so there is little danger of overheating.

Repairing Belt Conveyors

By A. M. Oliver

The average concentrating mill has in daily use a considerable amount of conveyor belting. This belting represents the investment of hundreds and even thousands of dollars and plays an important part in the operating of the mill. Yet it is not unusual to see an expensive belt, several hundred feet long, go out of service prematurely on account of a damaged surface. It often happens that a crowbar or some other heavy tool is dropped on it, tearing a hole in its rubber cover, which is there to protect the belt from abrasive wear. The plies of duck, thus exposed, quickly rot.

There is a way of repairing this damage: If the rubber cover is merely torn back—that is, if all of the cover is there, being only peeled from the body of the belt—the trouble is easily corrected. Wash with gasoline both the cover and the first ply of duck that is exposed. Allow it to dry thoroughly. Do not attempt to do any more until the gasoline is completely evaporated. Then apply two coats of ordinary rubber cement such as is used on automobile tubes, leaving each coat of cement to dry. When the second coat is perfectly dry, press down the cover of the belt and rub firmly with a file handle or some other dull tool, making sure that no air bubbles remain under the cover.

When the belt cover is completely torn away, it is necessary to replace it. How this is done depends upon the size of the hole. On a small hole, about the size of a silver dollar, wash the damaged part carefully with gasoline, as above described. Any tire dealer will sell you a small can of "tire putty," in appearance similar to common putty. Work this putty with your hands until it is the shape of the hole to be repaired, dip in gasoline, and then press it firmly into the hole.

When a larger area of the surface of the cover is damaged, proceed as above; then cement a piece of an old automobile tube over the exposed duck.

THE PETROLEUM INDUSTRY

Core Drilling in Oil Fields of Southern California

Single- and Double-Barrel Drills Used as Substitutes for Fish-Tail Bit—Double-Barrel Drill Superior Though More Expensive

In southern California, core drilling in oil wells has risen, in the short space of one year, from a theory to a substantial practicality, state J. E. Elliott and F. C. Merritt in a recent report of the California State Mining Bureau summarizing operations in the California oil fields. Primarily designed to obtain a sample of sands suspected of containing oil, the uses of the core drill are multiplying, and operators are depending on it to a greater extent every day. Two types of core drills are in use in southern California fields—single-barrel and double-barrel drills. Devices which take scrapings from the walls or bottom of the hole, and which are popular in Texas, are not in use in southern California.

A. W. Ambrose describes a single-barrel core drill, used in Texas, and virtually the same thing is being used today in hundreds of wells in California. In its simplest form it consists of a length of drill pipe from 3 to 8 in. in diameter, with from four to sixteen teeth cut in one end with a hack-saw or oxy-acetylene flame. Alternate teeth are bent slightly in either direction just as the teeth of a saw are set. This is for the purpose of giving clearance for the escape of the cuttings. This contrivance is rotated slowly on the bottom of the hole, and when it is decided that enough core has been cut, considerable weight is given to the pipe for the purpose of bending the teeth in to form a basket, and the pipe is withdrawn from the hole. In slightly more complicated form the pipe contains a bulkhead about 4 ft. above the teeth, in which is a valve which permits the escape of the fluid that will be entrapped when the barrel enters the hole. Immediately above this bulkhead are holes in the walls of the pipe, which permit the escape of the mud flush.

The double-barrel core drill consists, roughly, of two concentric barrels, between which the mud flush passes directly to the bottom of the hole. These two barrels are attached to various types of cutting shoes. The inner barrel is usually from 2 to 3 in. in diameter. The core passes up through this inner barrel and is protected by it from the mud flush. This inner barrel may be of any desired length, and it is fitted at the top with a valve which permits the escape of the entrapped fluid. The essential difference between the single-barrel core drill and the double-barrel core drill is that in the latter the mud flush can be carried directly to the bottom of the hole without coming in contact with the core. This cannot be done with a single-barrel, and it is a detail that is vital to the extraction of good cores.

The various types of core drills are designed to be substituted for the fish-tail bit. Careful manipulation is a prime requisite with all types of core drills. This point cannot be emphasized too strongly.

The chief advantage of the single-barrel drill is its low cost and the fact that it may be made up quickly by any mechanic. In some kinds of formations it extracts samples which serve the purpose, particularly in soft shale. Its chief disadvantage is that the material extracted is more of a sample than a core, and this material cannot be relied upon as being a true sample of the formation at the bottom of the hole. There are two principal reasons for this: First, the holes for the escape of the circulating fluid are from 3 to 6 ft. from the cutting edge. The barrel is run in and there is no way to circulate out the heavy mud, cavings, and cuttings that have settled in the bottom of the hole since the last run of the fish-tail bit. This material is often compressed into a cylindrical form, which, to the uninitiated, has the appearance of a core. One such alleged core contained in the heart of it a fragment of a cement sack. The second great fault with the single barrel is the fact that if it is rotated too rapidly or given too much weight it will quickly generate great heat, and in extreme cases the barrel will become plastic and flow, resulting in a great knot of iron, which is sometimes difficult or impossible to extract from the hole. In this case the formation being cored will be sintered or even fused so that it loses its original identity. . . . It is not as yet widely realized that incipient fusion may result in erroneous conclusions regarding the formation cored.

A properly constructed double-barrel core drill costs more to build and operate than the single barrel, but the results obtained more than justify the added expense. Much longer cores can be obtained than with the single-barrel, and, owing to its tool steel teeth, it can bore in hard material that the single barrel cannot reach. The double-barrel core drill extracts a core that is similar in appearance to cores extracted by the diamond drill. The formation extracted is exactly as it is in nature, without being washed by the mud flush or being burned. As circulation passes to the bottom of the hole it is possible to get rid of heavy mud and cavings in the bottom of the hole before coring starts, and also to keep the cutting edges cool during the coring operation.

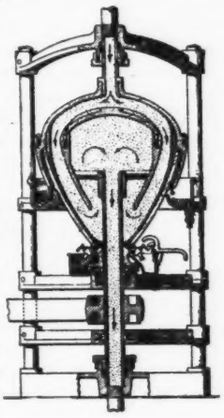
Imperial Oil Co. Finds Gas Only in Alberta to Date

Oil drilling operations in Alberta by the Imperial Oil Co. have so far produced nothing of value except natural gas, although drills have been put down to a considerable depth. The well at Pouce Coupé struck gas at 1,675 ft., with a flow of 10 million cubic feet per day and was put down to 2,612 ft. without encountering oil. At Mine Head a 15-in. hole is being drilled and a depth of 1,400 ft. has been reached without finding gas or oil. The Fabyan well is down 2,600 ft., with a strong flow of gas. The well at Monitor has attained a depth of 3,100 ft., and that at Willow Creek 2,700 ft., but without results. On Sept. 11 a well was started just west of Soults, on the international boundary, which at latest accounts was down 1,000 ft.

Recent Patents

Drill—No. 1,422,264. A. L. Hawkesworth, Butte, Mont. The drill bit covered by this patent was described in the Aug. 5 issue of the *Engineering and Mining Journal-Press.*

Rotary Amalgamator — No. 1,423,169. Russell Thayer, Philadelphia. The character of this machine is shown in the accompanying cut. The pulp is fed at the top and the inner cone rotated, the mercury spreading itself over the inner smooth surface owing to centrifugal force. Provision is made at the bottom of the outer cone for drawing off the heavy amalgamated product.

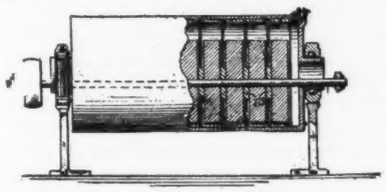


Oil Shales—No. 1,422,204. W. W. Hoover and T. E. Brown, New York City. Wells are driven in a subsurface deposit of oil shale, and explosives introduced which fracture the formation so that it is permeable to a heating medium, subsequently introduced. This heating medium is then circulated through the shale, converting the bituminous material into recoverable oil.

Discharging Smelter Gases — No. 1,422,575. W. H. Howard, Salt Lake City, assignor to American Smelting & Refining Co., New York City. Stack gases injurious to vegetation are diluted by injecting into the stack another gas of an unobjectionable character having a temperature above that of the atmosphere, the mixture so made, diffusing into the atmosphere, being harmless to vegetation.

Chloride Volatilization—No. 1,425,667. Samuel McKirahan, Golden, Colo., assigner of two-thirds to F. A. Fuller, Denver. Finely ground oxidized ores are mixed with sodium chloride, the mixture heated above 1,000 deg. C. to volatilize the metal chlorides, and the metal recovered from the volatile product.

Tube Mill—No. 1,428,687. Jose Ferencz, Curityba, Parana, Brazil. In this tube mill, as shown in the illustration,



a shaft extends throughout the mill, being carried on the trunnions at either end. On this shaft are mounted grinding rollers which come in contact with the lining of the mill at the bottom.

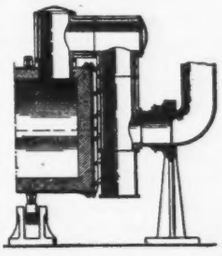
Roasting Zinc Blende—No. 1,422,701. F. W. Harboard, London, England. Complex zinc sulphide ore or concentrate, or zinc blende, is finely ground and injected by a blast of air against a surface within an externally heated muffle chamber. As the material falls down the incline of this chamber to a collector below, the desired degree of roasting is obtained. A dust catcher is also provided.

Vertical Retort Furnace—No. 1,422,684. Ferdinand Fiechtl, Cherryvale, Kan. A smelting furnace with vertical retorts, removable covers therefor, a mechanism for opening and closing the bottoms, and means for introducing compressed air around the retorts.

Refining Copper-Nickel Matte — Canadian patent No. 220,718. The British America Nickel Corporation, Ltd., Kristiansands, S., assignee of N. V. Hybinette, Christiania, Norway, and R. L. Peek, Ottawa, Ont. A method for electrolytically separating the copper from the nickel of converter matte, and of purifying nickel-copper sulphate electrolytes.

Flotation Reagent—Canadian patent No. 219,757. Canadian Luckenbach Processes Co., Ltd., Toronto, Ont., assignee of the Luckenbach Processes, San Francisco, assignee of Royer Luckenbach, New York City. The reagent may comprise liquefied wood pitch; the reaction product of a pitch, an alkali, and a salt; or the reaction product of a rosin pitch and an alkaline reagent.

Converter-Gas Discharge Pipe — Canadian patent No. 219,392. The American Smelting & Refining Co., New York City, assignee of W. H. Howard, Salt Lake City. Gases from a converter treating copper matte are removed by a closely fitting discharge conduit at the end, rotating with the converter, instead of passing through the throat at the center, as is the common practice.



Hydrometallurgy of Copper — Canadian patent No. 219,866. C. J. A. Dalziel, London, England. Finely ground ore is leached in acid, and the pulp, without filtration, passed through electrolytic cells, an air blast being used for agitation to prevent sedimentation.

Recovering Vanadium — Canadian patent No. 219,939. P. A. Mackay, London, England. Vanadium pentoxide is separated from vanadium ores or vanadates of lead by the use of oleum.

Vertical Zinc Retorts—No. 1,424,823. Archibald Jones, Pittsburgh, Pa. A zinc-smelting furnace with vertical retorts arranged in rows in a chamber, and a fixed condenser arranged between each two rows.

Technical Papers

South African Mining—The Department of Mines and Industries, Capetown, South Africa, has issued the annual reports of the Secretary for Mines and Industries and the Government Mining Engineer for the year ended Dec. 31, 1921. Price 10s. 6d.

Cottrell Precipitation—A paper on the electrical engineering features of the electrical precipitation process was presented at the meeting of the A.I.E.E. in Vancouver in August. The article embraces a discussion of source of power, methods of rectification, direct current, relation between precipitation and impressed voltage, and power consumption. Copies of the paper may be obtained from the Research Corporation, 25 West 43d St., New York City. At the same meeting "Electrical Precipitation of Solids From Smelter Gases" was presented. This paper describes the Cottrell process from the standpoint of the smelter metallurgist. A third paper, "Recent Conclusions Pertaining to Electrical Precipitation," was presented by Walter A. Schmidt, of the Western Precipitation Co.

Reheating Compressed Air—University of Illinois Bulletin No. 130 (Engineering Experiment Station) is a 95-page discussion of the reheating of compressed air when expanded in motors, to prevent freezing of the exhaust. Copies may be obtained for 50c. each from the Engineering Experiment Station, U. of I., Urbana, Ill.

Flotation of Gold Ores—The July number of the *Journal* of the Chemical, Metallurgical and Mining Society of South Africa, Johannesburg, price 3s. 6d., contains a seven-page paper on "The Application of Flotation to the Antimonial Gold Ores of the Murchison Range." The article describes flotation, cyanidation, roasting, and amalgamation tests that were run on the ores, from which it was determined that flotation following amalgamation would be required for the best recovery.

Portland Cement—U. S. Bureau of Mines *Reports of Investigations,* Serial No. 2,377 (five pages; obtainable on request to the Bureau at Washington, D. C.), discusses the storage and transportation of portland cement. A plea is made for the shipment and storage of cement as unground clinker, to be pulverized as needed, though this of course is advisable only where the amount to be used justifies the expense of a grinding plant.

Excavating Machinery—U. S. Department of Agriculture Bulletin No. 300, "Excavating Machinery Used in Land Drainage," has recently been revised. The present edition contains 59 pages, and may be obtained from the Department at Washington, D. C., on request. The bulletin is well illustrated, and much of the machinery described will interest mining engineers.

SOCIETIES, ADDRESSES, AND REPORTS

What Is a Trade Association?

Definition Prepared by Leaders of American Trade Association at Hoover's Request

The executives of the American Trade Association, comprising secretaries of more than 100 of the leading trade associations of the country, have recently framed a definition of what constitutes a trade association, at the request of the Secretary of Commerce. The definition was adopted in an annual convention:

"A trade association is an organization of producers or distributors of a commodity or service upon a mutual basis for the purpose of promoting the business of their branch of industry and improving their service to the public through the compilation and distribution of information, the establishment of trade standards, and the co-operative handling of problems common to the production or distribution of the commodity or service with which they are concerned.

"Although the activities of trade associations are necessarily many and varied, the following are likely to be found in any such association:

"1. Scientific research of the materials, products, processes, and markets of the industry to be used as a basis for improvement.

"2. Educational work with members: Dissemination of market reports and information concerning business conditions and probable future trends; compilation and distribution of vital statistics of the industry, such as number of plants, capital investment, tonnage of shipments, stocks on hand, wage scales and schedules; campaigns for eliminating waste, introducing improved methods of production, establishment of standards, accounting and selling throughout the industry, vocational education, and similar purposes.

"3. Market expansion: Promotion of the use of the products of the industry and development of new uses.

"4. Legislative: Presentation of the needs of the industry at Washington and in the several states with respect to pending legislation.

"5. Transportation: Presentation of the needs of the industry with respect to railroad services and rates, handling of complaints of members with the railroads, and auditing freight bills.

"6. Credit work: Gathering and dissemination of credit information about customers.

"7. Prevention of trade abuses, as against both members of the industry and the public.

"8. Establishment and standardization of trade terms, names, and customs.

"9. Publicity: Dissemination to the public of information of interest and value concerning the industry.

"The following types of associations are frequently mistaken for trade associations:

"1. Associations with a membership consisting of business houses engaged in a variety of businesses, as, for instance, an association consisting of manufacturers of miscellaneous commodities not connected with a specific industry.

"2. Professional and technical societies consisting of individuals in their professional or technical capacity rather than business units, such as societies of credit men, accountants, sales and advertising managers.

"3. Non-mutual associations, in which any surplus of income over expense is neither returned to the members nor used directly or indirectly to increase the service to members.

"4. Associations organized for a single purpose, or a limited number of purposes, such as associations of manufacturers which are traffic service bureaus.

"Associations which are organized as trade associations, but which actually undertake activities within a limited field only are not trade associations in the full sense of the term. It is impossible to distinguish between a real trade association and a limited one of this type of definition; the distinction is a matter of fact. If it is the general policy of an association to undertake, within its means and power, any type of activity which the development and protection of the industry or its members may require, it is a real trade association; if it generally gives serious consideration to activities of a certain type only, it is not a real trade association. However, such limited associations usually perform desirable functions from the standpoint of both their members and the public."

Industrial Co-operation Topic at New York Section Meeting

Co-operation between employers and employees was the topic discussed at the monthly meeting of the New York Section of the A.I.M.E., which was held at Machinery Club, New York, on Nov. 8. Cleveland E. Dodge, vice-president of the Phelps Dodge Corporation, told how his company's employee representation plan had worked since it was put in operation about a year ago, though this period was too short, he said, to permit conclusions to be drawn. Howard N. Eavenson, of Pittsburgh, told of the way in which housing conditions had been improved at Gary, W. Va. James Larkin, assistant to the president of the Bethlehem Steel Corporation, described their plan of employee representation, a vital point of which is that the representative is safeguarded against discrimination in doing his duties by a constitutional right of appeal to the Secretary of Labor. Sidney J. Jennings, recently elected president of the American Mining Congress, said that it behooved a manager to see that some plan was adopted to remove causes of justifiable complaint, but that such a plan must come from the management and not be foisted upon him by a board of directors. E. P. Mathewson told of the plans to combat state licensing of engineers. Robert Linton presided.

Patent Exposition in New York Next February

An exposition will be held in the Grand Central Palace, New York City, Feb. 17 to 22, 1923, the object of which will be to give all inventors full opportunity to show the public, the manufacturer, the merchant, the capitalist and financier the possibilities for utility, business, trade and commerce that lie in their inventions. This will be known as the Universal Exposition of Inventions and Patents. It is intended that it shall be a clearing house through which men of originality may be brought into personal contact with capital as well as with those in need of improvements in machinery, devices and practice. The exposition will be held under the auspices of the Universal Patent Exposition Corporation, 110 West 40th St., New York.

Lake Superior Mine Safety Conference Meets

George Martinson, of Hibbing, Minn., was re-elected chairman of the Lake Superior Mine Safety Conference at the close of its third annual session at Duluth on Oct. 28. S. E. Quayle, of Virginia, Minn., was re-elected secretary and the following were elected members of the executive committee: B. D. Shove, of Ironwood, Mich.; W. H. Moulton, of Ishpeming, Mich.; and G. H. Lohnies, of Biwabik, Mich.

More than eighty engineers interested in mine safety work were present. The speakers included George McCaa, of the U. S. Bureau of Mines; W. G. Brown, of Hibbing, A. H. Rohweder, of Duluth, W. E. Conibear, and W. H. Moulton, of Ishpeming, and J. T. Vickers, of Biwabik.

Mining Institute of Scotland Holds Annual Meeting

A general meeting of the Mining Institute of Scotland was held in Glasgow on Oct. 25. The Institute's Norman Henderson prize of £5 was awarded to David Penman for his paper on "A New Method of Measuring Ventilating Resistances, With Special Reference to the Operation of Mine Fans in Combination." A similar prize was also awarded to William Brazenall for a paper on "Pipe Friction and Pump Efficiency."

MEN YOU SHOULD KNOW ABOUT

Stewart Campbell has been re-elected State Mine Inspector of Idaho.

Edwin E. Chase has returned to Denver after a few weeks spent in Boston.

Ivan Ragaz, president of the Parreña Mining Co., is at Taxco, Guerrero, Mexico.

G. W. Wallace, of Oakland, Calif., has been examining the tin mines near Monticello, N. M.

N. D. Bothwell, of Anchorage, Alaska, is at the Britannia mine, Britannia Beach, B. C.

Roy Weathered, of Wallace, Idaho, has gone with his family to Los Angeles for the winter.

Alexander Legget is now employed as superintendent at the Richmond mine, near Saltese, Mont.

F. R. Weekes, mining engineer of New York, has been in Virginia City, Nev., in the interest of the Middle Mines.

The permanent address of **Eliot Blackwelder** will be Stanford University, Palo Alto, Calif., beginning Dec. 1.

Charles Butts has just finished an inspection of the marble belt in Tennessee in co-operation with the State Survey.

J. M. Hill, of the San Francisco office of the U. S. Geological Survey, is in Washington for conferences regarding western work.

J. L. Danziger, of New York City, inspected the lepidolite deposits of Taos County, N. M., during the last two weeks of October.

Lee L. Filius, construction engineer on the new United Comstock mill at Gold Hill, Nev., has gone to Joplin, Mo., for a month's stay.

J. P. Mertie, Jr., of the U. S. Geological Survey, has completed his field work adjacent to Fairbanks, Alaska, and is returning to Washington.

Charles A. Mitke, consulting engineer of Bisbee, Ariz., has been in the Globe district for some time, engaged in consulting work at the various mines.

J. Q. Peterson, of the U. S. Geological Survey, has completed field work in Idaho and will be in Ephraim, Utah, a few weeks before returning to Washington.

H. A. King, vice-president and general manager of the Sinclair Oil & Gas Co., coastal division, with headquarters in Houston, was in New York recently.

H. R. Robbins sailed from Vancouver on Oct. 20 for New Zealand, Australia, and other countries as special foreign representative of the American Cyanamid Co.

Wade L. Wetmore has recently resigned his position as mechanical superintendent of the Granby Consolidated M. S. & P. Co., Ltd., and is now at Woodland, Calif.

Jesse J. MacDonald is now the representative of the Southwestern Engineering Co. for the Republic of Mexico, with offices at 16 de Septiembre, No. 5, City of Mexico, D. F.

J. R. Court, of London, a director of the Spartan Oil Co., Ltd., is investigating conditions in the Coults and Wainwright oil fields of Alberta on behalf of British financiers.

E. H. Walker, of Boston, has returned from a visit to Porcupine, where he and his associates have acquired large interests and are preparing to operate on a large scale.

William J. Quigley, of El Paso, Tex., president of the Britannia Mining & Smelting Co., is inspecting the work done upon the company's new concentrator at Britannia Beach, B. C.

R. S. Sterling has resigned as president of the Humble Oil & Refining Co. and has assumed the chairmanship of the board of directors. **W. S. Farish**, formerly vice-president, succeeds Mr. Sterling as president.

W. D. Abel is in Los Angeles in charge of engineering work for the California State Corporation Department. Mr. Abel has been temporarily transferred from the San Francisco office of the department.

U. A. Garred returned this week from the Katanga smelter, in the Belgian Congo, where he has been superintending the installation and operation of a plant for supplying pulverized coal to the copper blast furnaces.

J. S. Bowman has severed his connection with the Moctezuma Copper Co., at Pilares, Sonora, to become construction engineer for the Westinghouse Electric and Manufacturing Co., with headquarters at El Paso, Tex.

George L. Collard, of Pittsburgh, vice-president and general manager of the Shenango Furnace Co., recently visited the various properties of the company on the Mesabi iron range, accompanied by **E. J. Maney**, manager of mines.

Duncan C. Milsom, oil geologist of Los Angeles, was in Queensland in October looking into the possibilities of that state for oil production. He had visited Roma and Beaudesert, and intended going through the Queensland western country.

Alex D. Chisholm, general manager of mines for the Steel & Tube Co. of America, has returned to Ironwood, Mich., following a year's absence in Rio de Janeiro, Brazil, where he was in charge of a large construction contract for the Leonard Kennedy Co.

H. W. Edmondson supervised and completed development work for the Vivian Mining Co., at Oatman, Ariz., which work included crosscutting by diamond drill both the Mitchell and Leland veins from the 700 level. Mr. Edmondson is now at Manhattan Beach, Calif.

Dr. W. H. Collins, Director of the Canadian Geological Survey, has returned from a visit to the field parties which are making investigations in Nova Scotia and New Brunswick, and reports important discoveries of new coal beds and oil-shale deposits in both provinces.

G. H. Cunningham, chief engineer for the Electrolytic Zinc Co. of Australasia, has been visiting the Continent, Scandinavia, and England for some months on behalf of his company. Mr. Cunningham has also spent several months in the United States, and returned early this month to Australia, sailing from San Francisco.

Rodman Meacham resigned on Nov. 1 as general manager of the Rosiclare Lead & Fluorspar Mining Co., Rosiclare, Ill., and will devote his entire time to the development of fluorspar properties in Kentucky which he has acquired in the last few years. Mr. Meacham becomes president of the Keystone Fluorspar Co., with offices at Hopkinsville, Ky., operating mines in Mexico and Kentucky.

George H. Harbordt has been appointed assistant to **Heath Steele**, president and general manager of the Compañía Minera de Peñoles, S. A., and other Mexican subsidiary companies of the American Metal Co., Ltd., of New York. Mr. Harbordt formerly was superintendent of the Monterey lead smelter and refinery of the Peñoles company. Recently he has been holding the position of general superintendent of the metallurgical department.

Joseph J. Taylor, of Montpelier, Idaho, one of the veteran mining engineers of the West, who is known in southeastern Idaho as the "Father of Phosphate," recently presented to the School of Mines of the University of Idaho a large portion of his professional library, including many rare and government documents now out of print, and dating back to the early 60's. This is to form the nucleus of a special School of Mines library which has been named, in honor of the donor, the Joseph J. Taylor Collection."

M. Emanuel de Margerie, of the University of Strasbourg, French exchange professor in applied science and engineering, has arrived in this country to take up his work for the academic year 1922-23 in seven leading technical schools. He has begun work at Columbia University, where he is lecturing on applied geology, especially as applied to topography. Other institutions at which he will appear are Harvard, Cornell, Johns Hopkins, Yale, Massachusetts Institute of Technology, and the University of Pennsylvania. The American exchange professor under this arrangement is **Dean John Frazer**, of the University of Pennsylvania, who has already begun his task in France.

Mining and metallurgical engineers visiting New York last week included: **Howard N. Eavenson**, of Pittsburgh, Pa.; **Stanly A. Easton**, of Kellogg, Idaho; **D. A. Lyon**, of Washington, D. C.; **R. D. Ferron**, of Bolivia, S. A.; **F. E. King**, of Panama City; **F. L. Wolf**, of Mansfield, Ohio; **J. Rodman**, of Pittsburgh; **E. P. Dargin**, of Cincinnati; and **C. R. Kuzell**, of Clarkdale, Ariz.

THE MINING NEWS

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Leading Events

UTAH COPPER has started its Magna concentrator, shut down since the armistice. The plant has been thoroughly remodeled, to include flotation.

Iron-ore shipments from the Lake Superior region will total 42,000,000 tons as the season ends.

A special committee representing all groups in the mining industry of California has drafted a set of recommendations to minimize the hazards of mine fires.

Graphite mining is being resumed in Alabama, and reports announce the resumption of tungsten mining in Colorado.

Preliminary work on the construction of the new mill at Cortez, Nev., is under way.

The Hammon Consolidated Co. has shipped two new dredges to Dome for erection during the winter.

The Britannia Mining Co., in British Columbia, has closed a contract for electric power for its entire operations.

Gold mining at Normanby, Queensland, has been revived.

The sinking of a million-dollar shaft has been authorized by the New Modderfontein company, on the Rand.

Cripple Creek production increased 15 per cent in October.

Hollinger and Dome companies warn against wildcats in northern Ontario.

Copper Queen Will Employ 250 More Men at Morenci, Ariz.

The Morenci (Ariz.) mines of the Phelps Dodge Corporation are continuing to increase their forces; 200 to 250 men will be required in the next thirty days to put production on the 1,400-ton per day basis that has been decided upon. The concentrates from No. 6 mill will continue to be shipped to the Copper Queen smelter at Douglas. The Clifton smelter will not open at present.

A "get-together" meeting of department heads was held at the Morenci Hotel recently, sixty-five men being present, including the Phelps Dodge official staff and heads of the engineering, mining, milling and smelting departments. This was the first meeting of the kind since the consolidation of the Arizona Copper, Ltd., interests and those of the Phelps Dodge Corporation in the district. J. P. Hodgson, manager for the P. D. interests, spoke briefly to his "fellow workmen" in what he described as "the largest mining proposition in Arizona, both in point of acreage and tonnage of ore." He described the present situation as regards copper as being somewhat uncertain, but at any rate, he said, it was much better than it was a year ago. He said, further, that the Copper Queen branch smelter was operating at two-thirds capacity, the plant at Nacozari at about the same, and the Morenci plant at about 20 per cent of normal capacity. Captain Hodgson stressed the point that the keystone of the arch of co-operation and loyalty was in the proper handling and consideration for the men employed.

Aluminum Coins in Bulgaria

The Minister of Finance of Bulgaria will soon announce an adjudication for the striking of aluminum coins of 1 and 2 leva, according to dispatch to Reuters from Sofia. The composition of the alloy will be as follows: aluminum, 90 per cent; zinc, 8 per cent, and copper, 2 per cent. Nov. 30 is mentioned as a probable date for the adjudication.

Fire Destroys Concentrator at Picher, Okla.

The mill built in 1917 by the Buffalo Mining Co., which was taken over a few months ago by the White Mining Co., was destroyed by fire on Nov. 8. It was in the northeastern part of Picher and was a modern concentrator throughout. Loss is estimated by Otis White, manager of the company, at $90,000, with only $12,000 insurance. The mill had been running double shift for some time. Mr. White announces it will be rebuilt immediately, and hopes to have it operating again in sixty days or less. About eighty men were thrown out of work temporarily by the burning of the mill.

Asbestos Royalty Reduced by Government in Quebec

Complying with the request of producers of asbestos in the Thetford Mines district, the provincial government of Quebec has reduced the royalty on asbestos produced in the province from 5 per cent to 2½ per cent. A statement widely published to the effect that the royalty had been changed from $5 to $2.50 per ton is incorrect.

Lake Superior Season's Iron-Ore Shipments 42,000,000 Tons

Shipments of iron ore from the port of Marquette in October amounted to 231,074 tons, bringing the total for the season to Nov. 1 to 1,857,564 tons. This compares with 1,544,068 for the same period of 1921. Not all of the Marquette Range ore goes east by the way of Marquette, considerable being transported to Escanaba, on Lake Michigan. The total for the entire Lake Superior region to Nov. 1 is 39,192,625 tons, not including all-rail shipments, and the season's total will be about 42,000,000 tons, or close to the estimates made last spring. Many of the operators have already suspended shipments for the year, and little ore will be moving by the end of November.

Rhodesian Output of Chrome Ore and Diamonds Increases

The British South Africa Co. announces through Reuters the following mineral output from Southern Rhodesia during September. Comparative figures are given for the preceding month and also for the corresponding month last year:

	September 1922	August 1922	September 1921
Gold, oz.	55,443	56,037	52,436
Silver, oz.	4,393	14,196	12,977
Coal, tons	46,070	49,465	54,504
Chrome ore, tons	20,495	8,973	nil
Copper, tons	288	278	262
Asbestos, tons	1,558	1,712	588
Arsenic, tons	17	23	18
Mica, tons	5	3	4
Tin, tons	1	nil	nil
Diamonds, carats	46	15	nil

The number of producers is 176 and the value of the gold produced £240,846.

Chief Consolidated Will Develop New Ground Intensively

Utah Company Has Acquired Large Acreage in Tintic—Mined $38 Ore in Last Quarter

The Eureka Hill property, the last to be taken over by the Chief Consolidated interests in the Tintic district of Utah, is to be opened to lessees under the leasing system developed by the Chief. The company has been steadily adding to its holdings in the central part of the district, so that in addition to the Chief proper it now controls ground covered by the Plutus, Grand Central, Gemini, Ridge & Valley, Eureka Mines, and the Eureka Hill Mines, a property recently held by a close corporation headed by Utah capitalists.

The shaft will be retimbered and other improvements will be made. At present a few lessees are working. This mine, which in years past has produced millions, is expected to respond profitably to intensive development. At the Grand Central new ore has been opened on the 1,300 level, the work having been done under contract by the Walter Fitch, Jr., Co. This ore—high-grade silver lead ore and siliceous silver ore—is making toward the adjoining Plutus, and the find is considered to be of such importance that the ground is being worked under the community leasing system, which has been used in the larger stopes of the Chief itself. By this system the miner is guaranteed a larger wage and often earns two or three times the usual miner's wage. At the Gemini production has been begun, and forty lessees are working. About 50 tons of ore daily now is being shipped.

The report of the Chief for the third quarter of 1922, accompanied by checks for a dividend, paid at the rate of 10c. per share, shows a net profit for the quarter of $100,585. Production amounted to 26,008 tons of ore, which brought $574,543 after payment of smelting, transportation, and sampling charges. The average gross value of ore was $37.78, and the average net value $22.03 per ton. The cost of the new holdings is given in the report as sightly exceeding $500,000, of which $150,000 was paid down, notes being given for the balance, payable in four quarterly payments.

Tonopah Mining Co. Fined $500 as Result of Accident

A short time ago three miners employed by a contractor were killed in the shaft of the Herrick mine, in West Shiningtree, Ontario, by the falling of the crosshead. The Herrick is under option to the Tonopah Mining Co. of Nevada. Upon investigation it was found that the crosshead was operating without safety devices, and, as a consequence, information was laid by the Mines Inspection Department against the Tonopah Mining Co. and against the contractor. In the police court at Sudbury both parties were fined $500, with costs.

Utah Copper Co. Starts Magna Plant

The Utah Copper has started the first unit of 1,000 tons at the rehabilitated Magna mill, at Garfield, Utah. The plant, which is the oldest and largest of the so-called porphyry concentrators, has not turned a wheel since immediately after the armistice. In the interim, however, the equipment has been changed and flotation has been installed. Other units will be started later. The total capacity with twelve units will be more than 15,000 tons daily. The Arthur mill is treating about 16,500 tons daily.

Million Dollar Mine Shaft for New Modderfontein

By Cable from Reuters to "Engineering and Mining Journal-Press"

Capetown, Nov. 8.—Sir Evelyn Wallers, presiding at the annual meeting of the New Modderfontein Gold Mining Co., said that a circular shaft is to be sunk on the southwestern part of the property at a cost of £200,000. The work is to be spread over five years, but sinking operations would not be started until June next.

Hollinger Warns Against Wildcat Neighbors

The Hollinger Consolidated Gold Mines, Ltd., is sending warnings to shareholders to beware of promoters of wildcat mining companies, who are taking advantage of the prominence of the Hollinger by using its name in connection with their enterprises. In some cases they emphasize the proximity of their properties to the Hollinger or the similarity of the geological formation, but other schemes falsely represent the Hollinger officials as being interested in sundry propositions and offer special inducements to Hollinger shareholders. Shareholders at different points in the United States have received long-distance telephone messages to this effect. The same sort of warning has been mailed by the Dome Mines Ltd., to its shareholders.

Phosphate Mining Languishes in Florida Fields

Phosphate mining in Florida is much depressed, according to reports to the Bureau of Mines. One of the principal districts is operating at less than 40 per cent capacity. The decline of the mark and the franc is given as the principal reason for the loss of much of the foreign market, and the advent of the boll weevil in the eastern portion of the cotton belt has resulted in uncertainties as to credits and has reduced greatly the domestic market for phosphates.

Indian Gold Output

By Cable from Reuters to "Engineering and Mining Journal-Press"

London, Nov. 11.—The production of gold in India during October totaled 82,025 ounces.

Coeur d'Alene Zinc Ores Will Be Marketed

Federal Contracts With U. S. Smelting Co. to Take Zinc From Morning Mine—Callahan Ships to Grasselli

The Federal Mining & Smelting Co. has closed a contract for the sale of the zinc product of the Morning mine, at Mullan, in the Coeur d'Alene district of Idaho. The Morning ore contains both lead and zinc, and for almost two years there has been no market for the latter, the high freight rate making shipment prohibitive. When zinc was at the lowest figure the company for a time allowed much of the zinc mineral to go away with the tailing, without attempting to save it. For months, however, the zinc concentrates have been stored in anticipation of improved market conditions, which have now arrived. A contract has been entered into with the United States Smelting & Refining Co. for the entire Morning zinc output, to include also approximately 2,500 tons now on hand. Loading the accumulated stock is going on as rapidly as cars can be procured, the shipments going to the smelting plant in Oklahoma.

It is understood that the U. S. company will also take the zinc product of the Success mine, where there is also an accumulation of about 200 tons of zinc concentrates. The Callahan mine began production on Nov. 2 after a shutdown of two years. Its chief product is zinc, which is under contract to the Grasselli Chemical Co.

Graphite Mining Being Resumed in Alabama

Operating conditions in the Alabama graphite field are beginning to show significant and marked improvement. The Dixie Graphite Co. at its Pocahontas plant is making a steady and increasing output of standardized crucible flake, which is being disposed of without difficulty. The plant of the Ceylon Graphite Co. in Coosa county, is also now reported as making a regular output, as is also the Taber plant, in Chilton county. The last named plant is the only one in the district using the electrostatic method of separation, a process unsuccessful in other parts of the field on account of the presence of iron in the ore. The Superior Flake Graphite Co. is also overhauling its plant preparatory to resuming operation as soon as possible.

Locomotives Need Repair; Ore Accumulates at Colorado Mines

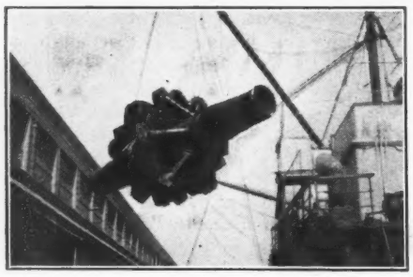
Shipments from the mines of the Telluride district in Colorado for October totaled 105 carloads, against 143 the previous month and 155 cars in October 1921. The falling off in shipments was due to a lack of locomotives in operating condition to move the cars. The Smuggler and Tomboy yards are full of cars which cannot be billed out, as the Denver and Rio Grande road is unable to move them.

California Gold Dredges Go to Nome

Hammon Consolidated Company Is Erecting Two New Machines — Cold-Water Thawing Will Be Used — Review of Nome's History

By George J. Young

TWO MODERN gold dredges are being erected near Nome, Alaska, by the Hammon Consolidated Goldfields Co., which hopes to begin actual dredging early in the summer season of 1923 on the third beach (terrace) at Little Creek, 3½ miles east of the camp. A Diesel-engine electric power plant, with a capacity of 1,575 hp., is being erected at Nome to supply the required power. Upon the success of the present venture will depend the expansion of the enterprise. The effective thawing of the gravel appears to be the most critical part of the undertaking.



Upper tumbler and shaft

Dredges, most of them small and many of them inefficient, have been operated in the district since 1903. According to Otto Halla, the first successful attempt at gold dredging was made by W. L. Leland, manager of the Three Friends Mining Co., on Solomon River. Other dredges were constructed soon afterward, and since then dredging has been continued. The largest machine had 7-cu.ft. buckets, and work was confined to the first and second beach lines and creek bottoms. One was operated on the ocean beach, which will be remembered as a boneyard of mechanical contrivances for a distance of five miles.

The entry of the W. P. Hammon interests into the Nome district was the result of the preliminary investigation of the dredging possibilities upon certain areas that were known to carry gold but had never been exploited, chiefly because of the depth and frozen character of the ground. The development of the cold-water thawing process by John H. Miles opened up possibilities of deeper dredging than had been hitherto attempted in the Nome district. The Hammon company acquired all of the holdings of the old Pioneer Mining Co., including lands, ditches, and water rights, excepting only the short railroad which was acquired by the Alaska Railroad Commission. The property of the Pioneer Mining Co. had been worked principally by hydraulic elevators and giants. It was being operated last September by five hydraulic elevators. The new company began preliminary operations to dredge the property in the summer of 1922. The work to begin next summer will be the first operation of its kind upon the third beach. In its natural state the gravel is frozen. Cold-water thawing has been greatly improved by the Hammon Engineering Co. It is the plan of the company to keep a large acreage thawed out in advance of dredging operations.

The upper bench of gravel is 65 to 100 ft. deep and the lower bench 40 to 50 ft. The bedrock is mica schist. The area that affords possibility of dredging is unusually large compared with the areas of other gold-dredging districts. The gravel when thawed is easily dredgeable, and is finer and contains more clay and muck than gravels dredged in favorable fields in California. The labor conditions will be excellent, as trained dredger men will be brought from California fields. Local labor will be used to supplement these men. It is anticipated that dredging will be conducted during seven months of the year. The temperature drops to 60 deg. below zero in winter, and operations will in consequence be stopped during the period of critical cold.

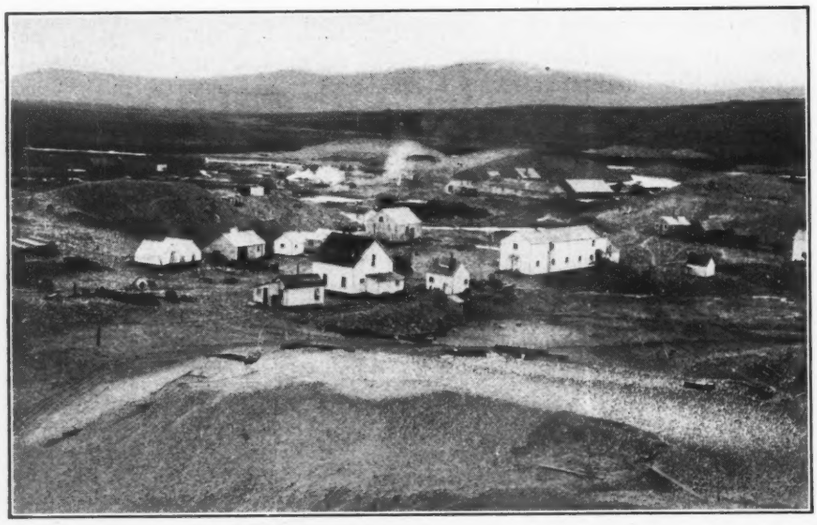
Both dredges are alike in practically all of their details, excepting that one is designed for a digging depth of 60 ft. and the other for 40 ft. The hull trusses and gauntries are of steel construction, and the bottom, sides, and decks of the hulls are of wood, as wood will better withstand freezing and water conditions. This composite type of hull construction is considered to be better engineering than an all-steel hull.

The dredges have 9 cu-ft. buckets, and are expected to dig 6,000 cu.yd. per twenty-four-hour operating day. The monthly output anticipated is 200,000 cu.yd. The buckets are of manganese steel, with bottom and hood cast integrally. A plain outside lip is riveted to the bucket and the bucket line is close-connected.

Because of the clay and muck in the gravel, the screening area is larger than that usually provided. It totals 900 sq.ft. in area, the dimensions of the revolving screen being 9 ft. in diameter by 39 ft. in length. Screen openings are ½ to ⅝ and ⅝ to ¾ in., tapered hole. Screen plates are of high-carbon rolled steel. The holes are drilled and tapered. One stacker is 160 ft. long; the other 142 ft. The conveyor belt is 36 in. in width. The gold-saving table area will be 4,400 sq.ft. The main drive is equipped with a 250-hp. motor; the pumps have motors aggregating 150 hp., and the total motor horsepower provided for each dredge is 602. The dredges in design and equipment embody all of the best features in dredge construction.

Bucket line idler

Power will be transmitted over a 3½-mile line to the dredges. The plant will consist of three 525-hp. Werkspoor full Diesel engines and three 538-kva. General Electric generators directly connected to the engines, which will supply 2,200-volt current. This voltage will be stepped up by transformers to 11,000 volts for transmission to the dredges. Oil storage consists of a 25,000-bbl. steel tank and a smaller steel tank of sufficient capacity for one day's operation inside the power house.



New camp for dredge operations at Nome

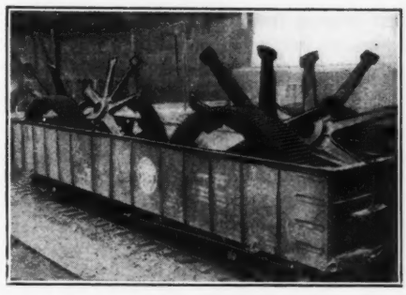
The power plant will consist of a wooden frame building with a wooden roof covered with corrugated steel. The inside of the building is to be lined with "amiwood." The foundation for the engines, motors, and the building will be of concrete.

An interesting detail was the rapid construction of the two dredges by the Yuba Manufacturing Co. The order was received on May 12, 1922, and within two weeks work was under way in the shops. In anticipation of the receipt of the order for the dredges, preliminary plans or lay-outs had been made for machines and equipment to meet the conditions. The plans, after the receipt of the order, were rushed to completion. The total time to Sept. 1 was ninety days. While the parts of the dredge and the mechanical equipment were being constructed and assembled, advance shipments of lumber, amounting to 1,000,000 bd.ft., for the construction of the dredge hulls and camp, together with tools and construction equipment, were made on the first steamer to Nome. The next steamer carried workmen and additional lumber not shipped on the first steamer.

Loading of the motorship "Culburra" began early in September. The cargo totaled approximately 3,500 tons and there were thousands of individual pieces. This was the first time on record that a large ocean-going vessel has transported a full cargo of gold-dredge parts.

The construction of the dredges will start immediately under direction of Paul E. Morse. The manufacturing company will erect the dredges and turn them over to the mining company ready for operation. The cost of the two dredges and power plant when ready for operation is estimated to be $1,250,000. H. R. Edward, chief engineer for the Hammon company, has been in Nome for the last three seasons, and is directing the development.

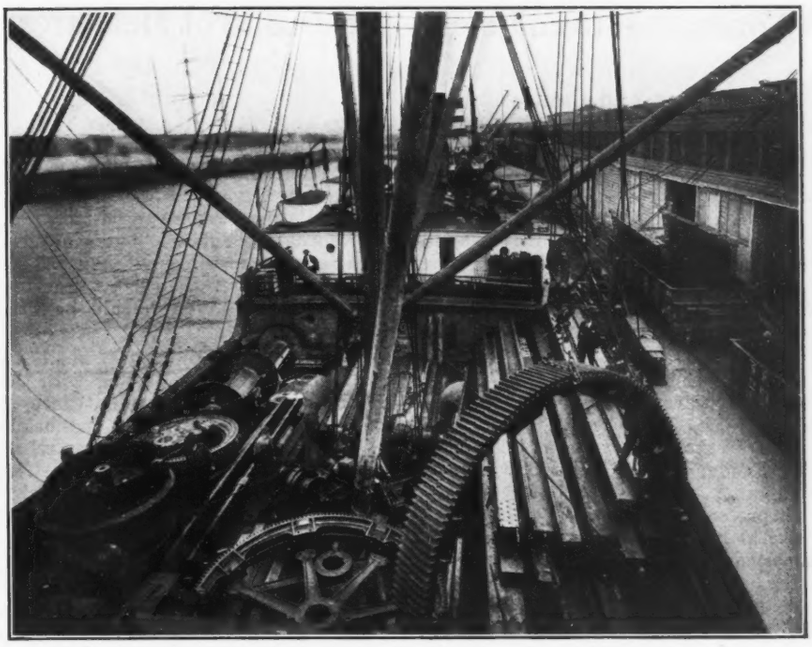
The following extract from the story



Bull gears

of Nome by Otto Halla will give a picture of its early history:

"With the opening of navigation in June, 1899, a rush of people arrived from all parts of Alaska and also from the States. In June, after the first-day sluicing was done on Discovery claim, and the amount of $9,000 was taken from the boxes that day, the magnitude of the discovery was appreciated. In July the beach diggings were struck.



Dredge machinery aboard motorship "Culburra"

People with rockers could make from $15 to $200 per day, and in some instances even more. The town of Nome came into existence, and by the closing of navigation in 1899 had grown to about 4,000 population. Several new finds were made on Snow Gluch, Glacier and Dexter creeks, Solomon River, Big Hurrah, Ophir Creek, Elkhorn Creek, Cripple River—all of which have proved to be paying properties. The output of gold dust in 1899 was calculated to have been $1,500,000.

"On the opening of the season of 1900 a new discovery was made on the beach near Top Kock point. On a stretch of 200 feet square, within three weeks, about $500,000 worth of gold dust was taken out with rockers; finally the pay was traced to Daniels Creek, which since has produced a large amount of gold dust. Anvil Creek and other creeks were opened up on a larger scale, and it is estimated some 20,000 new arrivals came into the district. The output of gold during the year 1900 was officially put at $5,500,000."

Nome has experienced the usual vicissitudes of placer districts. There was the peak of excitement, followed by expansion of operations wherever gold could be found in remunerative quantities, and then the hegira of disappointed prospectors and others who had failed to secure mining properties. Following this was an interval of intensive operation, and then began the slow decline. Nome has been slowly dying during recent years.

An analysis of the operations in 1920, taken from "Mineral Resources of Alaska, 1920," indicates the status of placer-mining operations for that year. The output of gold for the Seward Peninsula was valued at $1,300,000; of this, Nome contributed $540,000. During the summer 112 mines, employing a total of 540 miners, were in operation; in the winter 10 mines, employing 61 miners, were in operation. Dredging accounted for 17 mines, 145 miners, and an output valued at $475,000; hydraulic mining, 28 mines, 200 miners, and $500,000 output; drift mining, 14 mines, 65 miners, and $155,000 output; open cut (other than hydraulic) 53 mines, 130 miners, and $170,000 output. Seventeen gold dredges were in operation in the Seward Peninsula in 1920; in 1919, there were 24 dredges. In 1919, the dredges mined 865,000 cu.yd. of gravel, worth 52c. per yard; in 1920, 930,000 cu.yd., worth 51c. per cu.yd.

War Mineral Claimants Continue To Thrive

Subject to the approval of the Secretary of the Interior, the War Minerals Relief Commissioner has recommended the payment of the following awards: S. B. Potter, Takilma, Ore., $2,885; Seattle Silver-Lead Mining Co., Seattle, Wash., $7,485.28; George & George, Salem, Ore., $974; N. W. Atkinson, Melrose, Mont., $1,404.05; G. A. Fitzpatrick, Holland, Ore., $252; Jeldness & Tainor, Medford, Ore., $214.30; Jeldness, Gustine & Fry, Medford, Ore., $401; Daniel McLeod, Kerby, Ore., $437; Ralph S. Bennett, Grants Pass, Ore., $426.70; Byrnes & Danaher, Helena, Mont., $2,070.23; A. B. Puth, Holland, Ore., $144; William E. Davis, Bisbee, Ariz., $1,123.25; William H. Monroe, Coloma, Calif., $425.55; Mike Hurley, Livermore, Calif., $213.75; C. C. Doran, Ocean Park, Calif., $250.

A rehearing was denied in the claim of J. S. Shepherd, of Leadville, Colo., while failure to establish that there had been a net loss resulted in the disallowance of the claim of Welch & Horr, of Talent, Ore., and of Timothy Pearson, of San Francisco.

Committee Recommends Fire-Control Measures

Representatives of Operators, Employees, Industry at Large, and California Industrial Accident Commission Collaborate on Suggestions for Combating Mine Fires

AT A MEETING held on Nov. 6, at the office of the California Industrial Accident Commission in San Francisco, a special general committee considered a report suggesting measures for mine-fire control in California mines submitted by its subcommittee. The committee consisted of the following:

Representing mine operators—W. J. Loring (chairman), A. P. Busey, Jr., F. W. Nobs, O. McCraney.

Representing labor—James Lord, R. W. Rodda, J. C. Williams, Robert Milligan.

Representing California Metal and Mineral Producers' Association and the American Mining Congress — Edwin Higgins.

Representing the industry at large—George S. Rice, B. O. Pickard, George J. Young, R. E. Tremoureaux.

Representing the Industrial Accident Commission—G. Chester Brown, F. L. Lowell, H. M. Wolfiin.

W. J. Loring presided and the general committee adopted the following general principle:

"In considering the following suggestions, the general committee desires to emphasize its belief that no blanket rule or regulations can apply alike in all mines. It feels that the suggestions made herein should be considered in the light of basic principles that may be modified, in the judgment of the mine inspector, to meet existing physical and other conditions at each mine; furthermore, that this thought and intention should be embodied in the rules as finally adopted by the California Industrial Accident Commission."

The suggestions adopted by the committee subject to the foregoing premise are as follows:

Suggestions applying to fire control arrangements and equipment to be used in fire fighting and emergency situations.

1. All dry-timbered mine shafts which are used for working or as emergency exits shall be fireproofed, but where the use of concrete, gunite or other fireproofing material is not feasible, then a pipe system for the spraying or sprinkling of the shaft timbers shall be installed and used and the shaft timbers kept constantly wet. Where there is an insufficient water supply for the operation of sprinklers, the mine inspector shall require, as an alternative, the installation of adequate chemical fire-fighting apparatus, or, where feasible, the use of an approved fireproofing treatment of the timbers.

Provided that where mechanical ventilation has been installed and the working shaft is used as an incast, said working shaft only needs to be fireproofed. This will apply also to naturally ventilated mines when the working shaft is an incast and the ventilating head of the outcast shaft is sufficient to insure the same direction of the ventilating current at all times. If the ventilating current under natural conditions is unstable or may be reversed by a fire, then both working and emergency shafts should be fireproofed.

2. Emergency fire doors shall be placed in passages connecting with the emergency exit and at the entrance of the downcast shaft where bulkheads are not used or, if it be an upcast, at the entrance of said upcast shaft. The emergency fire doors may be used also for the control of the normal mine ventilation. In all cases the door frames of the emergency doors shall be constructed of concrete or other suitable material, and shall make a tight connection with the walls of the passageways. Doors may be constructed of wood covered with sheet iron and shall be provided with suitable latches or other mechanical devices so that they may be opened from either side. Additional fire doors shall be installed where they will serve to isolate fires or protect men.

Provided, that such emergency fire doors shall only be necessary where dry, timbered shafts cannot be fireproofed, or where it is inadvisable to keep the shaft timbers constantly wet, or where an insufficient water supply cannot be had to keep the shaft timbers constantly wet, or where heavily timbered stopes or other timber structures of an inflammable nature exist in the mine between exits. In all other cases fire doors shall be installed where it is deemed necessary by the mining engineers of the Industrial Accident Commission.

3. Where mechanical ventilation is used, the fan and the fan housing shall be constructed of non-combustible material and so installed as to admit of the reversal of the ventilating current by doors or gates. It is recommended that the principal ventilating fan be placed upon the surface and the fan house and air ducts in communication with the mine opening be fireproofed or constructed of non-combustible material.

Mechanical ventilation is recommended for large mines, especially those in which the air currents are variable and unstable.

4. Means for extinguishing fires, preferably a hose connected to a water main, shall be provided at dry shaft stations, pump stations and other places having a localized fire hazard. As an alternative, water barrels and buckets or fire extinguishers, of a type approved by the Underwriters' Laboratories, shall be provided. It is recommended that all water-main outlets, hose couplings, and nozzles shall have standard pipe thread where a water and hose system has been installed.

All electrical installations underground where interruptions to service would result in a fire hazard or where loss of life might occur as a consequence shall be provided with a supply of dry sand or an approved type of fire extinguisher. Where the carbon tetrachloride extinguisher is provided, care must be taken that it be not used where the ventilation is deficient.

5. In all mines employing 50 or more men underground on any one shift, it is recommended that auxiliary compressed-air lines with suitable outlets be provided in the emergency exit except where equivalent protection has been made.

6. Where connections have been established between neighboring mines for emergency exit purposes, it is recommended that telephones be provided for each connecting mine at the bulkhead doors. Compressed-air lines, equipped with locked valves, should be connected to the compressed-air system of each mine and should terminate in the space between the bulkhead doors, but should not be interconnected.

7. A surface fire alarm consisting of a siren or equivalent device shall be installed and used for the purpose of giving a general fire alarm when fires are reported in the surface plant or underground. As a means of informing underground workers of the presence of a fire, mines which are equipped with a compressed-air system shall install the method of stench warning, and, in addition, shall establish a general danger signal to consist of nine flashes or distinct interruptions of the electrical lighting current. Where compressed-air lines and electric lights are not available, a mechanical alarm system of approved type shall be installed.

8. Where exceptional fire hazard exists in a large mine, it is recommended that the superintendent or other person in charge designate where practicable places of refuge to which men may go in cases of extreme danger. Provision should be made to protect such places from an incursion of gas or fire by fire doors. Suitable portions of the mine workings may be used for this purpose in conjunction with existing fire doors, as provided in suggestion No. 2. Such places should be equipped with telephones and compressed-air lines provided with suitable valves and outlets.

Note: The connection of neighboring mines for emergency exit purposes has already been provided for in California Mine Safety Orders (Order 1723, p. 39).

9. Signs showing the direction to the emergency exit shall be hung at intervals in the used workings of every mine.

10. A sign shall be posted on each surface or underground ventilating fan station: "This fan shall not be stopped or reversed except by authority of the man in charge of the mine."

Suggestions applying to maps, fire plans and miscellaneous.

11. A plan of action to be followed in case of fire (surface or underground)

shall be formulated by each mine superintendent. All foremen, bosses, skip tenders, and shaft topmen, and other persons who may be designated by the superintendent, shall attend a monthly class of instruction, to be presided over by the mine superintendent, and they shall be quizzed by the superintendent as to their respective duties in the event of a fire or other emergency. It is recommended that where feasible, fire drills be conducted monthly.

It is recommended that the foregoing No. 11 supersede Mine Safety Order No. 1,712 (k).

12. Every mine employing twenty or more men on any one shift shall have prepared a skeleton map, chart, or blueprint, which shall show the position of exits, principal levels, manways, tunnels, shafts, fire-fighting water lines, telephones and telephone lines and compressed-air lines. Such map, chart, or blueprint need not be to scale, nor show boundary lines, outlines of orebodies or other unessential detail. Copies of said chart shall be placed in frames behind glass and shall be placed near the entrance of the mine usually used by the men and at the principal stations in the mine. A copy shall be sent to the chief mining engineer of the Industrial Accident Commission and filed by him in the records of his office.

13. Shift bosses and foremen shall be instructed by the mine superintendent to inspect mine workings on their regular rounds and report to the superintendent any conditions that in their judgment would increase the fire hazard in any part of the mine.

14. Shaft topmen designated by the mine superintendent for this duty shall be familiar with the mine workings and shall be trained to meet emergencies arising from mine fires or other accidents.

15. Fires for heating shall not be permitted underground, and open torches, acetylene lamps, and candles shall not be left unattended in any mine in the vicinity of wood or other inflammable material.

16. Oxygen breathing apparatus of approved type shall be available for use where required by emergency conditions. (See Mine Safety Order 1704.)

17. In the event of the discovery of a fire underground by any worker, foreman, shift boss, or other person, he shall give an alarm to the men in his near vicinity, who will carry the alarm to others, and he shall then proceed to the nearest telephone, if a telephone system is in use in the mine, or the nearest station point, if a fire-alarm system is in operation, and shall communicate with the surface, giving the approximate position of the fire; or shall operate said fire-alarm system. This information shall be communicated without delay to the mine superintendent or other person in charge of the mine at the time. When an alarm of fire has been given, it shall be the duty of the mine superintendent or other person in charge to proceed to get the men out of the mine without delay.

The committee approved the following:

"Where the use of a series of raises is contemplated for an emergency exit, the mine management is strongly advised to so select the position of the raises in question as to have them in line with one another, in order that hoisting equipment may be installed if necessary at some future time."

In view of the wide variation of mining conditions in the state, the general committee was of the opinion that a general recommendation to equip emergency or second shafts with hoisting apparatus would be inapplicable. With respect to auxiliary hoisting apparatus, the committee expressed the opinion that the mining engineers of the Industrial Accident Commission can make suitable requirements based on their judgment in special cases.

News from Washington

By PAUL WOOTON
Special Correspondent

Tariff Raises Tungsten Price—Domestic Mines Still Idle

$8 Quotation Much Below Figure That Will Warrant Reopening of Most Domestic Mines

Due in part to natural economic pressure, but largely to imposition of a tariff rate equivalent to $7.14 per unit, the price of tungsten has risen in the United States from quotations of $1.85 to $2 per unit as late as last March to around $8 per unit. Even at the increased price, domestic mines remain idle. Domestic production ceased after 1920, when the average price dropped to $7.86 per unit, from the $18.02 average of 1919, which latter was then lower than for some years.

Despite the fact that reports to the Geological Survey indicate that there is two to three years' supply of tungsten in this country, there appears to be little prospect of a break in the market, as the supply is held in strong hands, willing to sell only at favorable prices. Some steel makers are reported to have only a short supply remaining, indicating that demand will be stimulated before long.

These factors favoring a price increase are offset, however, so far as domestic mining is concerned, by a study of figures compiled by Frank L. Hess, in charge of the rare-minerals section of the Geological Survey, in a report covering 1921; they show that United States production of tungsten in 1918 was 5,061 tons, with an average price of $23.24 per unit, and dwindled to 327 tons in 1919, with an average price of $18.02; 216 tons in 1920, with an average price of $7.86, and disappeared entirely after that year, with further and drastic price declines. In 1915 the average price per unit was $29.30; in 1916, $33.98; in 1917, $18.40. Comparing the production table with the price table, it would appear that domestic mines do not find it profitable to produce tungsten when the price is below $20 per unit—and it is a long climb from the present range of $8 per unit to $20.

Most of the tungsten now on hand in this country came from China, where military operations have compelled continued working of the placer mines even at the very low price of $1.85 to $2 per unit, landed cost, which was paid here for some months.

The new tariff rate is approximately four times the price at which tungsten was being bought here last spring. The old tariff act did not impose a duty on tungsten imports.

Although the price has risen to approximately $8 in the United States, Chinese tungsten still is being sold in England at around $3 per unit.

The vanadium situation in the United States also is interesting. Produced here as a byproduct of radium, the output has ceased because of the radium market conditions. Imports, which have been principally from Peru, also have practically ceased. There is a supply in this country, however, equal to two to three years' normal demand for the product. The Ford Motor Co., which was the largest single consumer of vanadium, no longer uses this metal as an alloy in steel.

Copper and Ore Shipments Through Panama Canal Increase

September figures covering the movement of commodities through the Panama Canal show marked increases in the amount of copper and iron ore as well as of crude petroleum moving from the Pacific to the Atlantic. Copper shipments during that month totaled 25,158 tons; crude petroleum, 65,366 tons; iron ore, 39,000 tons; and phosphates, 14,000 tons.

Pittman Act Silver Purchases

Purchases of silver by the Bureau of the Mint during the week ended Nov. 11 amounted to 177,000 oz. This brings the total purchases under the Pittman Act to 140,714,576 oz.

"Class" Rate on Shipment of Ferromanganese Sustained

No logical reason exists why class rates should not be applied instead of commodity rates on unusual shipments of ferromanganese from Tacoma, Wash., in the opinion of the Interstate Commerce Commission, rendered in the case of Bilrowe-Alloys Co. versus the Northern Pacific Railway Co., in which the action of the carrier in applying the fifth class rate to ferromanganese was attacked. The manufacturer contended that the shipments in question should have taken lower commodity rates.

Coal-Mine Wages Attract Butte Miners, Says Reports

The metal mines in the Butte district are in urgent need of at least 3,500 men, according to reports being made to federal officials. There are several hundred men awaiting work at coal mines in Wyoming. An effort has been made to induce the unemployed in the coal fields to accept positions at Butte, but as the wages in the coal mines are so much higher than the current wage rates at Butte, most of the men prefer to stay at the coal mines and take the chance of employment developing. Reports from eastern coal mines indicate that men are applying for work in much larger number than they can be employed. High wages are the attraction there also.

Tungsten and Manganese Will Be Studied Thoroughly

Intensive research of certain features of tungsten and manganese resources have been begun by the Bureau of Mines. Every effort will be made to keep abreast with the American development of these deposits and to keep informed on the world supply of these two important minerals. The tungsten study is being made by A. V. Udell, a mining engineer on the staff of F. W. Bradley. The service of Mr. Udell, who has devoted much time to research into sundry aspects of the zinc mining and smelting industries, have been loaned to the Bureau for that purpose. J. W. Furniss, of Philadelphia, is doing the specialized work on the manganese research.

News by Mining Districts

By Special Correspondents in the Field

London Letter

Advance in Cam & Motor Shares in Light of Recent Annual Report—Mount Elliott Finances

BY W. A. DOMAN

London, Nov. 3—In consequence of the recent sharp and sustained advance in the shares of the Cam & Motor Gold Mining Co. (Rhodesia), the annual report and accounts to June 30 last have been scanned with more than usual interest. And there is much of interest in the report. The reduction plant has undergone reconditioning, with considerable advantage to the company. In 1917, 1918, 1919 and 1921 work was carried on at a loss, and in 1920 only development and experimental work was undertaken. During the year under review, a record of 168,700 tons was milled, for a working revenue of 36s. 6d. per ton and a working expenditure of 27s. 9d. per ton. The latter figure includes 3s. 1d. per ton for development redemption.

In June, expenses dropped 1s. per ton, and a further reduction is expected. There is still much to be done in the way of improving extraction, for the total for the year was only 70.36 per cent, of an average ore worth 44.9s., or 31s. 7d. In May and June this year the average was 77.5 per cent, and alterations now being made to the plant, including the operation of an additional tube, will further increase the extraction.

The development position is interesting. In the Motor mine the lowest level is the 11th Stope Drive South, where 960 ft. driven during the year averaged 183s. over 62 in. (reduced to 45s.), and the full width is not exposed. From this level two winzes are being sunk, one at 528 ft. south, and the other at 944 ft. south. The first is down 60 ft., disclosing 71 in. of reef at 71s., and the second 19 ft., exposing 53 in. of reef at 45s. In neither case is the full width yet exposed. A satisfactory orebody is therefore being opened up. On the 10th level, 184 ft. in the stope drive south showed 58 in. of reef at 38s., full width not yet determined. Similar conditions are reported on the Cam lode, 110 ft. showing from 43s. over 64 in. to 47s. over 58 in. on the 6th level. A raise from the 8th level is up 15 ft., proving 47 in. of reef at 36s. Assuming that there have been no changes in the method of computation, the 5,394 ft. of development have opened up 234,810 tons of ore, an average of about 44 tons per foot, the total at June 30 being 666,110 tons; of an average value of 39.9s., at normal price.

The agreement between the Consolidated Mines Selection Co. and the Anglo-American Corporation of South Africa was sanctioned by the shareholders of the former at the meeting held on Monday.

Some time ago I wrote concerning the difficulties experienced in rearranging the finances of the Mount Elliott (North Queensland). The negotiations which have been in progress for some time have now been virtually completed under the lead of Edmund Davis, known familiarly as the Napoleon of Finance. It is believed that £500,000 in preference shares will be issued and offered to present holders of ordinary shares in the proportion of two preference for three ordinary shares held. Ordinary shareholders will receive no dividend until all of the preference shares have been repaid. Smelting operations were suspended in March, 1919, but the Queensland Government will construct a railway to Mount Oxide as soon as sufficient working capital is forthcoming to resume operations.

As the Consolidated Gold Fields has not received sufficient support in its application to Mazapil Copper Co.'s shareholders, it has decided to withdraw the offer and not to include the Mazapil Copper Co. in its big amalgamation scheme.

QUEENSLAND

Stamp Mill at Normanby Encourages Mining—"Shrimp Tin" May Rival Sardine Mine

By Our Special Correspondent.

Brisbane, Sept. 18—The operations that have led to a revival of the long-neglected Normanby gold field are reaching an interesting stage. In its early days this mining center was eclipsed by the far more attractive Charters Towers field, then newly discovered, and for many years the Normanby was practically abandoned. The attempts to resuscitate mining there during the last two years have been encouraging, but the field has been handicapped by having no milling plant and by extremely bad means of access, the road to the port of Bowen, about 50 miles long, being traversable only by means of pack teams. Now, however, a twenty-stamp battery, with all requisite appurtenances, is being put up by the principal company operating on the field, and will be ready for use in two or three months. As the government, in advancing money for the machinery, stipulated that a certain number of stamps should be reserved for public use, the different mines from which the output has been showing good results on assay will soon have an opportunity of proving the quality of the ore in bulk. The erection of the mill has greatly stimulated mining activity, and a large tonnage of ore awaits treatment. Moreover, a good road has just been found connecting with a newly opened railway from Bowen to the Bowen River coal field, and the distance to this railway will be only about 35 miles.

On the Kangaroo Hills tin field, which is about 100 miles northeasterly from Charters Towers, the Shrimp mine is turning out remarkably well. A late advice states that in the bottom of a new shaft, which is down only 6 ft., there is, over its full width, ore averaging 30 to 40 per cent of black tin; the full width of the orebody is not yet known. This disclosure indicates that from a low-grade proposition the Shrimp is developing into a rich mine that may rival its famous neighbor, the Sardine, which is two miles away.

There seems to be some hope that the rising price of molybdenite may result in a resumption of mining for that metal in Queensland. The molybdenite mines of this state, which have been closed down since the government relinquished control, in 1920, are reputed to be richer in grade than any other molybdenite mines in the world, and for this reason should be the first to resume operations when quotations become sufficiently high—that is, if wages are reduced, as they have been in the United States.

Though most of the Queensland molybdenite came from the Chillagoe and Herberton districts, in the far north, the Wonbah mine, at Mount Perry, much further south, proved to be the richest mine of the kind in the commonwealth.

BRITISH COLUMBIA

Britannia M. & S. Co. Contracts for Electric Power

Sandon—The American Boy mine, after lying dormant for fifteen years, has been reopened. A winze was started on the 800 level on a stringer of lead-silver ore 6 in. wide, which has increased in width to 2½ ft. at 30 ft. from the collar. The ore assays 115 oz. silver, 74 per cent lead, and 3½ per cent zinc, according to E. N. McCall. On the 400 level a shoot of zinc ore 4½ ft. wide and 350 ft. long is being mined, and shipments will soon start to the Trail smelter. This property suspended operations in 1916 after producing $200,000 in ore.

Vancouver — George Kidd, general manager for the British Columbia Electric Ry. Co., has announced that his company has entered into an agreement to supply the Britannia Mining & Smelting Co. with 4,500 to 6,000 hp. of electric energy for ten years, with option of renewal for an additional five years. The railway company will start at once on the construction of a high-tension line from its Lake Buntzen plant to Britannia Beach, a distance of 30 miles, which is expected to cost $150,000.

The Britannia has a 2,735-hp. plant, but during exceedingly dry summers and cold winters the water supply sometimes gives out entirely, and even under normal conditions it is necessary to supplement the water power by steam power. The contract with the B. C. Electric will entirely obviate this necessity in future, and will be both cheaper and more convenient than the use of coal. The mining company will build its own substation, to which the electric company will deliver the power.

Victoria—A deputation consisting of Mortimer Lamb, representing the Canadian Mining Institute; Valentine Quinn, the Granby company; C. P. Browning, the Britannia company, and Dr. Hawkins, the Belmont-Surf Inlet company, has waited on the Hon. John Hart, Minister of Finance, with a view to obtaining a reduction on mine taxation, particularly on depleted orebodies. The deputation was promised that the matter should receive the consideration of the government.

MANITOBA

Mining Corporation Drilling Flin Flon Deposit

Flin Flon—Diamond drilling was carried on at the Flin Flon copper property all last summer by the Mining Corporation of Canada, which has so far spent altogether about $500,000 on the property. A deposit of quartz has been found about 10 miles distant, which will be used for flux. It contains sufficient gold to pay for the mining and transportation. The company is planning to obtain power from Birch Falls, on Salmonweir River, 35 miles west of the mine, where it is thought that an adequate supply of electric energy can be developed.

ONTARIO

Montreal-Ontario Will Restart Mill—Reorganization for Dome Mines

Cobalt—In view of the strong financial position of the Nipissing, and the high heads going to the mill, it is anticipated that a bonus will be paid in addition to the January dividend.

For the week ending Nov. 3 the Mining Corporation shipped six cars of residues, containing 489,000 lb., and the Dominion Reduction Co. one car of flotation concentrate, containing 87,000 pounds.

Montreal-Ontario directors announce that milling will be started as soon as 5,000 tons of ore is available. This property was the big disappointment of the camp. When the mill was started returns were only about $2.50 a ton, resulting in a heavy operating loss, and it was soon closed. Recently a new manager was appointed, who claims that the poor results were due to dilution from waste rock. He also states that 100 tons a day of $8 ore can be drawn from the 450 level and estimates a profit of $2 a ton. Though it is doubtful if these expectations can be realized, the results of further work will be awaited with interest. The Montreal-Ontario is on what is known as the south "break," and its profitable operation would result in greatly increased activity in the camp.

Kirkland Lake—The new vein found during the summer in the Wright-Hargreaves shaft at a depth of 600 ft. has continued in the shaft to 800 ft., the present depth. This discovery constitutes an important addition to the Wright-Hargreaves property, as it has a width of about 6 ft. and averages $12 to $13.

Two hundred feet of drifting has been done on the 250 level of the Costello property of the Associated Gold Fields, at Larder Lake. The vein averages $8 over 6 feet.

Porcupine—Owing to the burning out of one of the generators at the Sandy Falls plant of the Northern Canada Power Co., it has been necessary to put into effect a power reduction of 15 per cent. As a consequence the mines have started up their steam plants, and will probably have to keep them in operation until about January, when it is expected that the Sturgeon Falls plant will be completed.

Dome directors have announced a reorganization plan, whereby the number of shares of the company is to be increased and shareholders will receive four new shares, of no par value, for each share in the present company. It is understood that no further repayment on capital account will be made, and that the dividend rate will be increased. There are 477,667 shares of Dome outstanding, which have a par value of $9. No reason is given for the proposed change, but it is understood that some of the larger shareholders believe that under the new arrangement the shares will be more readily marketable and will also possess a higher security value.

CALIFORNIA

Grass Valley Mines Employ 1,300—Ben Hur Divide Will Ship

Jackson—Articles of incorporation have been filed in the office of the county clerk of Amador County for the Marklee Mining Co. The property concerned is northeast of Volcano and consists of an old quartz mine. The company has a capital stock of $100,000 in 100,000 shares of the par value of $1 each.

At the Moore mine, near Jackson, ten stamps are in operation. By Nov. 20 it is expected that the entire 24 stamps will be dropping.

Preparations are under way at Volcano to resume hydraulicking at the Elephant Deep gravel mine. The debris dam is being raised. During the winter three giants will be operated.

Lewiston—The newly constructed Gardella dredge on the Paulsen ranch, across the river from Lewiston, is now working. Three shifts are employed.

Grass Valley—An unofficial census of the number of men employed in the mines of the Grass Valley and immediate districts places the total at 1,300. Of this number, approximately 1,000 are employed by the North Star, Empire, and Idaho-Maryland mines, in the near vicinity of Grass Valley. It is many years since so large a force of miners has found employment in the district and conditions indicate unusual activity.

The Empire and North Star mines continue operating with large crews. At the Empire mine 80 stamps are dropping, three shifts being employed in all departments. At the North Star, 60 stamps are in operation, and at the Idaho-Maryland 20 stamps.

The shaft at the Normandie-Dulmaine mine, west of the city, is now down 350 ft., and at the 300 level crosscuts are being driven on the ledge.

A good showing in ore is reported at the Newtown Mining Co.'s property, operated by Lester M. Dull and associates. Exploration continues.

The Julia Ross mine is said to have a good showing of ore. Thomas Bath, who has been driving a tunnel on the Rame-Wundrom claims, in the Newtown district, also reports good prospects from a strike made recently.

Oroville—The McFarland mine is continuing to take out good ore. The E. K. Wood estate mine, of which J. F. Buell has charge, is continuing the work of prospecting. A Keystone drill is being used.

R. J. Reynolds, of Strawberry Valley, reports that work on the ten-stamp Straub mill which is being erected on the South Fork of the Feather River is progressing satisfactorily, and the mill is expected to be in operation within the next thirty days.

Randsburg—The Ben Hur Divide Mining Co. has contracted to ship fifty tons of ore per day, in the near future, to the Humboldt smelters, near Prescott, Ariz.

WASHINGTON

Whitman County Iron Co. Will Ship to Bunker Hill Smelter

Tekoa—Iron ore from the deposits east of town, owned by the newly formed Whitman County Iron Co., will begin production at once. Orders for a car of ore per day have been received from the Bunker Hill smelter, at Bradley, Idaho, and work has started to fill the order.

Northport—Twenty men are employed in dismantling the Cottrell plant of the old Northport smelter. The plant will be shipped to Chewelah to be used in the magnesite works to collect the dust from the calciners. Suits have been instituted by farmers against the magnesite companies, claiming damage to crops from the dust.

Republic—The Surprise mine is shipping thirty tons of gold ore per day from the 400 level. The oreshoot at this point is reported to be 350 ft. long.

The Quilp company has unwatered the lower workings of the mine, and has started stoping the ore on these levels. The orebody is 8 ft. wide and 335 ft. long and averages from $18 to $24 per ton.

The Last Chance has completed unwatering its workings and will soon join the list of producers.

All Republic shipments are to Trail, B. C.

Colville—The Chloride Queen mine is adding a steam plant and compressor to its equipment. This will greatly facilitate operations in exploration work at the mine.

NEW MEXICO

Silver Spot Mine Is Financed

Lordsburg—Ore shipments for the month of October for this district amounted to 6,916 tons of copper ore, 275 tons of silver ore, 33½ tons of silver concentrates, and 40 tons of talc. Siliceous silver ore to the amount of 132 tons was shipped from Steins during the last month.

Silver City—A holding company to be known as the Kirchman Mines Corporation has been organized by Robert I. Kirchman. It is the purpose of this company to take over and operate the Silver Spot mine, on Boston hill. Kirchman was formerly president and general manager of the Spot property, which has been developed by local capital. It is said that $125,000 is available for the new work, furnished by New Jersey investors.

Bayard—The Black Hawk Consolidated Co. has a new steam power plant in operation on its Combination claim, and is sinking an 800-ft. wet shaft to reach the bedding planes on which the Empire Zinc Co., a mile and a half to the north of the Black Hawk property, is operating, hoping to find them productive in zinc. The Lucky Bill has been leased to Ira Wright, on a long-time lease, and he is shipping two cars per week of mixed lead carbonate and galena averaging 33 per cent lead.

NEVADA

Preliminary Work at Cortez Progresses —Miners Strike at Goldfield

Virginia City—The 2,000-ton mill of the United Comstock Mines Co. is operating at three-fourths capacity, or treating 1,500 tons of ore per day; the extraction is said to be 94 per cent.

The Spearhead Gold Mining Co. is preparing to operate the old Succor mine. The shaft is to be retimbered to the 400 level. Equipment and supplies are already on the ground.

The 10-stamp mill of the Comstock Silver Mining Co. is to be started soon. Mill tests on ore from various parts of the mine indicate a probable extraction by cyanide process of over 90 per cent.

Cortez—At the Cortez mine camps for the accommodation of the mine crews and the mill construction crews are practically completed. Foundations for the power plant are being constructed, and machinery is already on the ground. Ample water supply has been developed in wells in the valley, and the water will be pumped to tanks above the mill. The process is to be wet concentration, which it is claimed will recover 55 per cent of the metallic contents, the concentrates containing nearly all the lead and copper in the ore. Tailings from the concentrators will be dewatered and cyanided. The mill is to be of 100-tons' daily capacity.

Royston—The Hudson Mining Co. has shipped a 50-ton car of ore to the Selby smelter, at San Francisco. The ore, said to assay $250 per ton in gold and silver, was mined from the 400 level. The shaft is to be sunk to the 700 level.

The Canadian Leasing Co., operating the Betts lease block, has a second car ready for shipment.

Candelaria—The new 300-ton cyanide plant of the Candelaria Mines Co. is treating 200 tons of ore per day and will reach capacity during November. Crushing equipment is ample for a much larger tonnage, and it is planned gradually to increase leaching and filtering equipment to 600 tons' daily capacity.

Goldfield—Miners and craftsmen employed in Goldfield, with the exception of those working for the Silver Pick Mining Co., went out on strike Nov. 1 when operators refused to raise wages to conform to the Tonopah scale. Present wages are $4.75 and $5.25. Operators have refused to grant any increase, and no settlement has been reached. The strike affects only about 50 men, as most of the work being performed in the Goldfield district at present is by leasers.

Pioche—The improved price of lead is stimulating development of the mines of the Pioche district, and mines idle for the last two years are preparing to resume. The Prince company is ready to unwater its mine, additional equipment being now on the ground, awaiting installation. Resumption of work at the Prince will result, in all probability, in the beginning of shipments of lead fluxing ore from the Virginia Louise mine, and the operation of the Prince railroad to serve the last-named mine.

A further payment of $5,000 was made this week on the Lyndon mine, in the Comet district, and extensive development work is planned in the district this winter. A carload of ore is in transit from the Lyndon mine to the A. S. & R. smelter at Murray, Utah. Negotiations are in progress for the sale of other properties in the Comet district, which has made a steady production from leasing operations during the last year. Shipments from the district have increased, now averaging approximately 2,000 tons per week. Siliceous tailings are being shipped to the Humboldt smelter, in Arizona, for use as a flux.

Settlement assays on a car of ore from the Queen of the Hills mine, in the Irish Mountain district, received this week, showed 47 oz. silver, 9.5 per cent lead, and 3.6 per cent copper, a total value of $58 per ton. The Irish Mountain district was the scene of the first discoveries of ore made in Nevada.

UTAH

Utah Consolidated Is Milling 800 Tons per Day—Skilled Miners Still Needed

Eureka—Tintic shipments for the week ended Nov. 4 amounted to 146 cars, compared with 142 cars the week preceding. The Chief Consolidated, in addition to its ore shipments, sent out eight cars of limestone, eight cars of road material, and one car of quicklime. Shippers were: Chief Consolidated, 51 cars; Tintic Standard, 37; Colorado, 14; Dragon, 8; Eagle & Blue Bell, 8; Victoria, 8; Iron Blossom, 5; Gemini, 4; Centennial-Eureka, 4; Empire Mines, 3; Tintic Drain Tunnel, 2; Bullion Beck, 2; Yankee, 1.

Bingham.—The Utah Consolidated is shipping about 800 tons of ore daily to its mill at Tooele. This plant began operating in June, 1922. The Utah Copper Co. is sending 250 cars of ore daily over the Bingham & Garfield R.R. to its Magna mill. Shipments from this camp—exclusive of ore sent out by the two companies just mentioned—amounted to 84 cars. Shippers were: United States mines, 38 cars; Utah Apex, 30; Bingham mines, 8; Montana-Bingham, 7.

Park City.—Shipments for the week ended Nov. 4 amounted to 3,917 tons. Shippers were: Park-Utah, 1,170 tons; Silver King Coalition, 1,012; Judge and Park City M. & S., 897; Ontario, 493.

Salt Lake City.—There is still a shortage of skilled miners in the various camps of Utah. This condition was brought to the attention of the mining committee of the Salt Lake City Chamber of Commerce at its weekly meeting by W. Mont Ferry, managing director of the Silver King coalition mine, at Park City. There has been talk of offering night school training to young unskilled laborers to prepare them to take places in the mines, as a possible means of meeting the shortage.

ARIZONA

Miami Operates Five Sections Out of Six—United Verde Increases Output

Clarkdale—The Copper Chief Mining Co. is gradually increasing shipments of ore from its property in the Verde district to the Humboldt smelter, eight cars being shipped during September. According to J. T. Mason, superintendent, smelter returns on the ore show a good margin over the cost of mining. freighting, and smelting.

Miami—The production of Miami Copper Co. for the month of October was 6,480,600 lb. of copper. This mine is now producing about 5,000 tons of ore daily, which supplies five sections of its concentrator, only one section remaining idle.

Phoenix—The idea "Buy something made of copper" was emphasized in an extensive exhibit shown at the Mines and Mineral building during the last week at the Arizona State Fair. This was made possible by the New Cornelia Copper Co., of Ajo. The hundred and one uses to which the metal can be put in the manufacture of articles of ordinary use was exemplified in the collection, which included scores of things from a screwdriver to an automobile radiator and a large copper kettle for hotel use. Copper shingles were also displayed, and the superiority of that material as a roof covering was vividly demonstrated to the observers. Another interesting exhibit was that of a mineral collection donated by Magma Copper Co., of Superior, showing the character of the copper, silver, and gold ores taken from the various levels of the mine, together with the country rock.

Jerome.—Production of the United Verde will show considerable increase for November as compared with the output during the last months, which has been approximately 5,250,000 lb. per month. The leaching experiments promise to add to the output by the recovery from low-grade ore.

COLORADO

Cripple Creek Output $406,728 for October; $365,500 in September

Trinidad—On Nov. 10, bandits held up and robbed Leo Gottlieb, paymaster of the American Smelting & Refining Co.. while he was on his way to the mines at Coakdale with a $14,000 payroll.

Denver—Initiated Law No. 3, providing for a reapportionment of the legislative districts of the state, and which would have deprived Colorado mining counties of a large number of their representatives, was defeated at the November election.

Boulder—William Loach, manager of the Wolf Tongue Mining Co., operating tungsten properties at Nederland, announces that his company is making arrangements to resume operations early in the coming year. The Wolf Tongue company is one of the largest in the field, but has been inactive for the last two years. It is rumored that other tungsten operators may resume in this district, where operations ceased soon after the signing of the armistice.

Cripple Creek.—The production from the mines of this district for the month of October shows a decided increase over that of the preceding month. The October tonnage was 35,137 tons, of a bullion value of $406,728, compared with the September output of 24.500 tons, valued at $365,500.

Colorado Springs—The Golden Cycle Mining & Milling Co., operating a plant in this city which treats the greater part of Cripple Creek ores, is planning to construct a steam-power plant of 2,000 kw. capacity at the Pikeville coal mine, a few miles north of this city. The plant will generate a current beyond the requirements of the Golden Cycle mill, but no announcement has been made of plans for disposing of the excess power.

OREGON

Bay Horse Mine Ships

Huntington—The Bay Horse mine has started a raise on the new orebody recently exposed east of the dike, and the values have increased 100 per cent in the raise. It is proposed to continue the raise 400 ft. to the surface. Since May the mine has shipped 63 carloads of ore, averaging $1,000 per car. The ore is sent to the Bunker Hill smelter at Bradley, Idaho.

MINNESOTA

Oliver Iron Mining Co. Will Build Screening Plant at Sweeney Pit

Hibbing—The Oliver Iron Mining Co. has started on the construction of a screening plant to serve the Sweeney open pit. The plant becomes necessary due to the encountering of an ore formation containing seams of taconite. The ore in this portion of the pit will be screened before shipment to the docks.

Chisholm—The reopening of the Shenango mine has been announced by the Shenango Furnance Co. The property will start with one shift, which will employ approximately eighty-five men and with possibilities of a second shift.

Coleraine—The Trout Lake concentrator, which serves the properties of the Oliver Iron Mining Co. in this district, has been closed for this season. The plant ran on only a 70 per cent basis during the last season, but at the present outlook it is anticipated that it will run to full capacity during ore operations next season. Stripping operations are being pursued in the Holman open pit and in several other properties of the Oliver.

Nashwauk—The LaRue Mining Co., a subsidiary of the M. A. Hanna Co., has leased the Crosby concentrator from the Cleveland-Cliffs Iron Co. for a term of years effective Jan. 1, 1923. The Crosby concentrator, which is a one-half unit plant, was operated on the washing of the ore from the Crosby mine, which lease has been relinquished by the Cleveland-Cliffs Iron Co.

MICHIGAN

October Copper Shipments Heaviest of the Year

Houghton—Copper shipments out of the Michigan district in October were the heaviest for the year, 15,110,000 lb. moving down the Lakes. This was several million pounds in excess of production. Calumet & Hecla shipped 12,066,000 lb., including copper of its subsidiaries. Of this amount 1,260,000 lb. came from the copper export storage at Dollar Bay. Copper Range, Mohawk, and Wolverine shipped a total of 2,794,000 lb. and Quincy, 250,000. The mines of the district will finish the year with practically no surplus metal.

October coal shipments were large, 107,369 tons of bituminous being received, compared with 80,812 in September. The mines will experience no fuel shortage during the winter, for present stocks will carry them well into the spring.

Quincy's No. 6 shaft, again in operation, is yielding more "rock" than when hoisting from its lower levels had to be taken care of by No. 2 while No. 6 was undergoing repairs. A splendid lot of mass is coming from No. 2 shaft.

Ahmeek continues to mine approximately 120,000 lb. of mass copper from its fissure vein in No. 2 shaft, and its total refined output per month is now on a basis of 1,600,000 lb. It is probable there will be little variance from this total throughout the winter, inasmuch as Ahmeek is building up an efficient underground force and the labor turnover is small.

JOPLIN-MIAMI DISTRICT

Federal Mining & Smelting Co. Will Drill New Leases

Miami—Fred Snow & Co. have opened up a new mine in Picher, a short distance east of the Vantage Co.'s No. 2 property.

The Marcum & Moses interests are operating the Lucky Jenny mine, at Hockerville, which at one time was reported as having been turned over to the Lucky O. K. Co.

R. L. Kidner, of Kansas City, and associates have taken over the Central mine, in Picher, and are operating it under the name of K. L. & B.

The Federal M. & S. Co. recently took over 200 acres of leases held by the Larsh Mining Co.; also the lease known as the Silver Plume. It will thoroughly prospect the last-named property for ore.

The Commerce M. & R. Co. is sinking two new shafts on what is known as the Tidwell lease, just north of the Bob White lease.

Lee Fillius, formerly district manager for the Anna Beaver Mining Co. in this field, has been in the district for some time; and it is reported that he may initiate a resumption of operations at the Anna Beaver mines.

The Commonwealth Mining Co. has closed down its No. 1 property, in the north part of Picher, as being worked out.

THE MARKET REPORT

Daily Prices of Metals

Nov.	Copper, N. Y., net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y.	Lead St. L.	Zinc St. L.
9	13.55	36.875	37.50	7.05	6.85	7.10
10	13.55	36 75	37 375	7.05	6.85	7.15@7.25
11	13.625	36 50	37 25	7.05	6.85@6.90	7.15@7.25
13	13.625	36 375	37.00	7.05	6 90	7.25@7.30
14	13.625	36.00	36.75	7.05	6.90	7.275@7.325
15	13.625	36.25	37.125	7.05	6.90	7.275@7.325

*These prices correspond to the following quotations for copper delivered; Nov. 9 and 10, 13.80c.; 11 to 15 inc., 13.875c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Engineering and Mining Journal-Press* and a special representative of the Federal bureaus in Washington which are interested in the mining industries.

London

Nov.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3M	Lead Spot	Lead 3M	Zinc Spot	Zinc 3M
9	63½	64⅛	70½	184½	185	26½	25⅜	38⅞	36¾
10	63⅝	64⅜	70½	184⅛	184¾	26½	25¼	39⅛	36½
11	63½	64⅝	70⅜	182⅜	182⅞	26¼	25⅛	39⅛	36⅞
14	63⅜	64¼	70¾	180	180¾	26⅜	25⅛	38¾	36⅜
15	63⅜	64¼	70¾	182¼	182⅞	26¾	25⅛	38⅞	36⅞

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Nov.	Sterling Exchange "Checks"	Silver New York Domestic Origin	Silver New York Foreign Origin	Silver London	Nov.	Sterling Exchange "Checks"	Silver New York Domestic Origin	Silver New York Foreign Origin	Silver London
9	4.46⅜	99¼	66⅛	33 7/16	13	4.46⅛	99¼	65¼	33
10	4.45⅜	99¼	65¼	33	14	4.47⅜	99¼	65⅜	32 15/16
11	4.45⅜	99¼	64⅝	32¾	15	4.46⅛	99¼	64⅝	32¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Metal Markets

New York, Nov. 15, 1922

Metal sales have been somewhat more active during the last week and prices have generally stiffened somewhat.

Copper

Sales have been very satisfactory throughout the week, and all of the copper available at 13.75c. delivered has been absorbed. Practically all producers have quoted 13⅞c. since Saturday, though on Thursday and Friday some was available at 13.80c. At least two producers are now quoting 14c., but are practically out of the market, and the quotation is purely a nominal one. Consumers report that business continues excellent, and many of them have booked more business into the new year than is usual at this period.

Foreign conditions are unsettled, and there seems little hope of a satisfactory foreign consumption in the immediate future. For some weeks European demands have been considerably less than they were a few months ago, but during the last week export sales were made in fair volume, France and Germany taking more than was expected.

Lead

The official contract price of the American Smelting & Refining Co. continues at 7c., New York.

Sales have been of about normal volume during the week, with regular customers of the larger producers able to book lead for December shipment at 7c. For prompt lead there is a pronounced premium, and small orders for November shipment have been booked at from 7.15@7.25c. This business represents only a small proportion of the total sales, however, the average price realized on all sales for the next two months being about 7.05c. St. Louis business has been confined to small orders at gradually advancing prices. In the last three days most of the lead has been marketed on a 6.90c. basis, though it is probable that on a good order 6.875 or 6.85c. could be done.

October production was much better than that for the preceding month, and there is now an indication that increased prices are having an effect on increasing the supply of domestic lead in addition to furthering the entrance of Mexican lead into this country.

Zinc

The market is strong, and the present tendency is to continue the advance that has occurred during the week. Heavier tonnages were sold for export than during the previous seven days, but generally for forward delivery—in some cases as far ahead as next March. One or two producers with a small supply of prompt zinc have remained out of the market. The largest proportion of business was done for future delivery, and spot metal commands a premium of 5 to 10 points. The market has been difficult to quote for that reason. Small spot tonnages might have been sold each day at prices slightly higher than those we indicate.

The statistics of the American Zinc Institute for October show that, although production increased, consumption remains above it: Stock on hand Oct. 1, 1922, 18,806 tons; production, 39,940; shipments, 40,703; stock on hand Oct. 31, 18,043; reported sold for export during October, 1,038 tons. The price of high-grade zinc was advanced on Saturday to 8.25c.

Tin

Prices for the week are not far different from those of the week before. In the last two or three days consumers have bought on a small scale, both of prompt and forward metal, but sales into consumptive channels are not yet large. Forward metal has sold at premiums of from ⅛@¼c. in the last four days; on the preceding days of the week the prices of spot and forward tin were the same.

Arrivals of tin, in long tons: Nov. 8th, London, 150; Straits, 25; 10th, Straits, 15; 13th, Straits, 650; China, 100; 14th, Liverpool, 50; China, 200; Straits, 500. Total so far in November, 1,910.

Gold

Gold in London; Nov. 9th, 92s. 2d.; 10th, 92s. 3d.; 13th, 92s. 3d.; 14th, 92s.; 15th, 92s. 2d.

Stock of money in the United States, Nov. 1, 1922: Gold coin and bullion, $3,901,857,711; standard silver dollars, $414,414,404; subsidiary silver, $269,885,995; United States notes, $346,681,016; Federal Reserve notes, $2,688,938,910; Federal Reserve Bank notes, $56,204,400; National Bank notes, $760,679,187; total, $8,438,661,623. Circulation per capita, $41.44. The gold stock increased $27,000,000 during October.

Foreign Exchange

On Tuesday, Nov. 14, francs were 6.63c.; lire, 4.64c.; marks, 0.01$\frac{7}{16}$c.; and Canadian dollars, $\frac{3}{32}$ per cent premium.

Silver

Continued selling by China has caused the market to decline still further, and at present there are no indications pointing toward higher prices.

Mexican Dollars—Nov. 9th, 50$\frac{1}{4}$; 10th, 49$\frac{3}{8}$; 11th, 49$\frac{3}{8}$; 13th, 50$\frac{1}{4}$; 14th, 50; 15th, 49$\frac{3}{8}$.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—General market for 99 per cent grade, about 21@22c. per lb.

Antimony — Chinese and Japanese brands, 6.60c., quiet. W. C. C., 6.90@7.25c. Cookson's "C" grade, spot, 8$\frac{3}{4}$@9c.

Bismuth—$2.45 per lb.

Cadmium—$1.15 per lb.

Cobalt—Metal, $3@$3.25 per lb.; black oxide, $2 per lb. in bbls.

Iridium—$240@$275 per oz.

Nickel—Standard market, ingot and shot, 36c.; electrolytic, 39c. Outside market, 32@34c. per lb.

Osmium — Pure, $70@$80 per oz. troy, in Los Angeles. Strong.

Palladium—$52@$55 per oz.

Platinum—$108 per oz. Nominal.

Quicksilver—$71@$72 per 75-lb. flask. Market firm. San Francisco wires $70.15.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $1.90 per lb.

Tellurium—$2.50 per lb.

Tungsten—Powder, 75c.@$1.05 per lb. of contained tungsten.

The prices of **Molybdenum, Monel Metal, Rhodium,** and **Thallium** are unchanged from prices given Nov. 4.

Metallic Ores

Chrome Ore—Indian chrome ore, $18.50 per ton, c.i.f. Atlantic ports. Rhodesian and New Caledonian, $23 and $25 per ton. Market quiet.

Iron Ore—Lake Superior ores, per long ton, Lower Lake ports: Old Range bessemer, 55 per cent iron, $5.95; Mesabi bessemer, 55 per cent iron, $5.70; Old Range non-bessemer, 51$\frac{1}{2}$ per cent iron, $5.20; Mesabi non-bessemer, 51$\frac{1}{2}$ per cent iron, $5.05.

Magnetite Ore—F.o.b. Port Henry, N. Y.: Old bed 21 furnace, $5 per long ton; old bed concentrates, 63 per cent, $5.25; Harmony, cobbed, 63 per cent, $5.25; new bed low phosphorus, 65 per cent, $7.50.

Manganese Ore—30c. per long ton unit, seaport, plus duty; equivalent to about 45c. Chemical ore, $75@$80 per gross ton.

Molybdenum Ore—60c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates, plus duty; equivalent to 85@90c. per lb.

Tungsten Ore—Chinese ore, $8 per long ton unit of WO_3.

Tantalum, Titanium, Uranium, Vanadium, and **Zircon** ore are unchanged from the quotations published Nov. 4.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 11.—Zinc blende, per ton, high, $46.40; basis 60 per cent zinc, premium, $47@$47.50; Prime Western, $45@$46; fines and slimes, $44@$40; average settling price, all grades of blende, $41.16; calamine, basis 40 per cent zinc, $23@$25.

Lead, high, $92.50; basis 80 per cent lead, $91; average settling price, all grades of lead, $86.25 per ton.

Shipments for the week: Blende, 8,925; calamine, 135; lead, 1,740 tons. Value, all ores the week, $521,160.

The largest purchase of any one week in the history of this district was made this week, totaling 19,530 tons. By steadily holding for higher quotations, sellers obtained further advances on all grades of ore.

Shippers have the promise of a supply of gondola cars for Eastern delivery, a few of which were loaded, advancing the average car tonnage this week to more than 45.

Non-Metallic Minerals

China Clay—Canadian, in lumps, $17@$18, f.o.b. Quebec. For other grades see issue of Nov. 4.

Feldspar — No. 1 pottery grade, $6.50@$7.50 per long ton; No. 2, $4@$5.50, f.o.b. North Carolina points. No. 1, $7.50; No. 2, $6.50, f.o.b. Connecticut points. No. 1, Canadian, $20 per net ton, f.o.b. mills. In Maine, $18 per ton, f.o.b. cars. First quality ground $21; second quality $16 per short ton, f.o.b. New Hampshire points.

Fluorspar—Fluxing gravel, 85 per cent CaF_2 and not over 5 per cent silica, $21.50, f.o.b. mines; not over 6 per cent silica, $21; 80 per cent grade, not over 5 per cent silica, $20; ground acid grade, $45 in bulk; ground enameling grade, $35 in bulk; packages, $4 extra, all f.o.b. mines, Illinois. No. 1 lump, $30; No. 2 lump, $25, f.o.b. Illinois mines.

Magnesite—$37.50 per ton, f.o.b. cars, California calcined, 90 per cent MgO or better.

Pyrites—Spanish, lump, 11$\frac{1}{2}$c. per unit; furnace, 2$\frac{1}{2}$ in. diameter, 12$\frac{1}{2}$c. per unit; fines, through $\frac{1}{2}$-in. mesh, 11$\frac{1}{2}$c. per unit; cinder property of buyer. Material runs from 50 to 51 per cent sulphur. Lump and fines, $5.75 per long ton; furnace size, $6.25, f.o.b. Atlantic seaboard.

Market limited to coast plants on account of brimstone competition and high freight rates to interior.

Asbestos, Barytes, Bauxite, Chalk, Emery, Fuller's Earth, Graphite, Gypsum, Limestone, Mica, Monazite, Phosphate, Pumice, Silica, Sulphur, and **Talc** are unchanged from the prices published Nov. 4.

Mineral Products

Arsenious Oxide (white arsenic)—firm at 11$\frac{1}{2}$@12c. per lb.

Copper Sulphate, Potassium Sulphate, and **Sodium Sulphate** are unchanged from quotations of Nov. 4.

Ferro-Alloys

Ferromanganese — Domestic, 78@82 per cent, $101 per gross ton, f.o.b., furnace. Spiegeleisen, 19@21 per cent, $39, f.o.b. furnace; 16@19 per cent, $38.

Ferrotungsten—Domestic, 70@80 per cent W, 85@95c. per lb. of contained W, f.o.b. works.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferro-uranium, and **Ferrovanadium** are unchanged from the prices published Nov. 4.

Metal Products

Lead Sheets — Full lead sheets, 10.25c.; cut lead sheets, 10.50c. in quantity, mill lots.

Zinc Sheets—$9.25 per 100 lb., with usual discounts, f.o.b. works.

Copper Sheets, Nickel Silver, and **Yellow Metal** are unchanged from the prices published Nov. 4.

Refractories

Bauxite Brick, Chrome Brick, Chrome Cement, Magnesite Brick, Magnesite Cement, Silica Brick and **Zirkite** are unchanged from the prices published Nov. 4.

The Iron Trade

Pittsburgh, Nov. 14, 1922

Except in sheets and tubular goods, buying is light. Car and locomotive material continues to move freely. Railroad buying of steel has been greater than for several years.

Steel prices are steady or firm, but with no premiums for delivery except small premiums in sheets. The American Sheet & Tin Plate Co. has not yet announced its sheet and tin plate prices for delivery after Jan. 1. Last prices were $4.75 for tin plate and 3.35c. for black sheets. Bars, shapes and plates are steady at 2c.

Pig Iron—The market continues practically stagnant. Bessemer and foundry have declined about $1, the market being now quotable at $32 for bessemer and $29 for basic, malleable or foundry, Valley.

Connellsville Coke—Furnace coke is off 75c. and foundry coke $2 since last report, at $6.75@$7.25 for furnace and $8@$9 for foundry. Demand is light. Some Eastern furnaces are said to be awaiting a $6 price to encourage their resumption, but operators state they can do better by selling their coal, which commands $3.75 to $4 for byproduct coking.

COMPANY REPORTS

Kerr Lake Mines, Ltd.

Silver, Ontario

A report of operations of Kerr Lake Mines, Ltd., for the year ended Aug. 31, 1922, shows that dividends of $430,000 were received from the Kerr Lake Mining Co., Ltd., from which $300,000 was paid in dividends to holders of securities of Kerr Lake Mines. Income account follows:

Administrative and general expenses		$29,974.46
Sundry explorations		6,336.29
Dividends paid		300,000.00
Balance		113,870.63
		$450,181.38
Dividends received from Kerr Lake Mining Co.		$430,000.00
Interest		18,902.14
Profit on sale of securities		1,279.24
		$450,181.38

Balance sheet as of Aug. 31, 1922, follows:

ASSETS

Kerr Lake Mining, Ltd., of Ontario, Canada:		
Shares acquired in consideration of the issue of capital stock of this company	$3,000,000.00	
Less amount received from Kerr Lake Mining Co., Ltd., applied to the reduction of the share capital	600,000.00	$2,400,000.00
Sundry investments:		
U. S. 4¼ Fourth Liberty Loan Bonds, at cost		$96,852.69
Accounts and bills receivable		268,127.15
Investments in outside properties:		
Tahoe Mine, Utah, 1,001,000 shares	$432,000.00	
Rimu Gold Dredging Co. Ltd., New Zealand, 95,238 ordinary shares ($400,000) 2,835 preference shares ($3,867.66)	403,867.66	
Wettlaufer Lorrain Silver Mines, Ltd., 150,000 shares	7,500.00	
Goldale Mines, Ltd., sundry expenses for which shares have been or are to be received	70,391.70	913,759.36
Cash		4,079.67
		$3,682,818.87

LIABILITIES

Capital stock:		
600,000 shares at $4 each, fully paid		$2,400,000.00
Kerr Lake Mining, Ltd.		50,359.47
Sundry liabilities		390.00
Unclaimed dividends		3,984.35
Profit and loss account		
Balance Aug. 31, 1921	1,114,214.42	
Plus		
Transfer from income and expenditure account	113,870.63	$1,228,085.05
		$3,682,818.87

Production for the year was 3,988 oz. of silver in 4,445 lb. of high-grade ore. Mining operations were discontinued at Cobalt on Feb. 1, 1922.

At the Tahoe mine a crosscut tunnel driven at a depth of 650 ft. measured on the dip of the vein, below the upper main tunnel, is developing ore fully equal in value to that in the upper levels. The capacity of the mill has been increased, and the mill is now treating about 250 tons of ore per day. During the period from Aug. 31, 1921, to Aug. 31, 1922, the Tahoe mine produced 977,606 oz. of silver and 2,676 oz. of gold, but so far the profits have been applied to the payments on account of the purchase price.

The dredge on the Rimu property has continued operating, and during the fiscal year 6,734.20 oz. of gold has been recovered. The value of the ground dug has been up to expectations, but, owing to certain mechanical difficulties, the yardage dug by the dredge was not as large as was expected. As a result a relatively small profit was made for the first eight months of the year. The profit for the month of August for this operation was the largest yet realized, being estimated, from telegraphic reports, at about $14,000.

No dividends from either of the above-named companies have yet been received.

The company has recently secured an option on sufficient shares of the capital stock of the Goldale Mines, Ltd., to give it control of that company if its option is exercised. This property consists of 1,904¾ acres in various parcels in the Porcupine gold district. Development work is being pushed on some groups.

Silversmith Mines, Ltd.

Lead, Zinc; British Columbia

A report of the operation of the Silversmith Mines, Ltd., from June 1 to Oct. 1, 1922, shows a gain of $83,350.57 for the period. The balance sheet as of Sept. 30, 1922, follows:

ASSETS

Mining property			$330,466.10
Buildings	$64,491.37		
Machinery and equipment	147,858.53		
		212,349.90	
Current assets, cash			76,434.84
Accounts receivable: ore in transit and on hand unsettled for Sept. 30			132,300.00
Deferred charges			7,416.28
			$758,967.12

LIABILITIES

Authorized capital stock		$750,000.00	
Less treasury stock unissued	$250,000.00		
Less amount issued in shares to be assessed in whole or in part	125,000.00		
		375,000.00	
Issued stock, 2,500,000 common shares, 20c. par value, paid up to 15c			375,000.00
Accounts payable			11,893.34
Accrued accounts (taxes)			29,613.50
Reserves:			
Depletion		168,287.70	
Depreciation		48,794.09	
			217,081.79
Surplus	$1,136.86		
Gain for fiscal year ending May 31, 1922	65,891.06		
		$67,027.92	
Less dividend No. 2		25,000.00	
			42,027.92
Gain for period June 1 to Sept. 30, 1922			83,350.57
			$758,967.12

During the month of June, the company milled 3,149 tons of ore, assaying 21.75 oz. silver, 8.6 per cent lead, and 6.2 per cent zinc. In the month of July, 2,923 tons of ore was milled, assaying 26.24 oz. silver, 10.07 per cent lead, and 6.93 per cent zinc. In the month of August, 3,169 tons of ore was milled, assaying 24.43 oz. silver, 8.97 per cent lead, and 7.17 per cent zinc, and in the month of September, 2,719 tons of ore was milled, assaying 27.5 oz. silver, 9.6 per cent lead, and 8.05 per cent zinc.

United Verde Extension Mining Co.

Copper; Arizona

A report of the United Verde Extension Mining Co. dated Nov. 1, 1922, states that the monthly average output slightly exceeds 3,000,000 lb. and the blast furnace as well as the reverberatory has been in use part of the time in order to keep up to that output. Copper sales have been good at an average close to 14c., and the company's stock in process of refining and selling covers present demands.

Assets follow:

Cash on hand Oct. 1922	$1,078,162.92
Liberty bonds, par value $3,365,100—market value	3,360,233.83
Copper Export Association, Inc., 8 per cent gold notes	463,000.00

The board of directors, at a meeting on Sept. 15, 1922, declared a regular dividend of 25c. per share and 25c. per share to cover the deferred dividend of Aug. 1, 1921, payable on Nov. 1, 1922, to stockholders of record at the close of business Oct. 5, 1922.

MINING STOCKS

Week Ended Nov. 11, 1922

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Ahmeek	Boston	58	58	58	Aug. '22, Q	$1.00
Alaska-Br. Col.	N. Y. Curb	2½	2	2½		
Allouez	Boston	20	20	20	Mar. '19	1.00
Anaconda	New York	52½	48½	49¾	Nov. '20, Q	1.00
Arcadian Consol.	Boston	2 7/16	2 3/16	2 3/16		
Ariz. Com'l	Boston	7¼	7	7¼	Oct. '18, Q	0.50
Big Ledge	N. Y. Curb	*9	*8	*9		
Bingham Mines	Boston	17½	17	17½	Sept. '19, Q	0.25
Calumet & Arizona	Boston	55	52½	52½	Sept. '22, Q	0.50
Calumet & Hecla	Boston	278	270	273	Aug. '22, Q	5.00
Canada Copper	N. Y. Curb	*3	*3	*3		
Centennial	Boston	†9	†8	8	Dec. '18, SA	1.00
Cerro de Pasco	New York	40	36¾	36¾	Mar. '21, Q	0.50
Chile Copper	New York	29½	26½	27		
Chino	New York	27	24¾	24¾	Sept. '20, Q	0.37
Copper Range	Boston	39	37	37½	Mar. '22, Q	1.00
Crystal Copper	Boston Curb	1 1/16	1 1/16	1¼		
Davis-Daly	Boston	3¼	3½	3½	Mar. '20, Q	0.25
East Butte	Boston	9	8¼	8½	Dec. '19, A	0.50
First National	Boston Curb	50	42	47	Feb. '19, SA	0.15
Franklin	Boston	1½	1½	1½		
Gadsden Copper	Boston Curb	†*80	†*70	*72		
Granby Consol.	New York	26¾	25	25	May '19, Q	1.25
Greene-Cananea	New York	25	25	25	Nov. '20, Q	0.50
Hancock	Boston	†2½	†2½	2½		
Howe Sound	N. Y. Curb	3	2¾	2¾	Jan. '21, Q	0.05
Inspiration Consol.	New York	38	34⅛	34⅛	Oct. '28, Q	1.00
Iron Cap	Boston Curb	†6	†4	5¼	Sept. '20, K	0.25
Isle Royale	Boston	20	19	19	Aug. '22,	0.50
Kennecott	New York	35½	32½	32½	Dec. '20, Q	0.50
Keweenaw	Boston	1½	1½	1½		
Lake Copper	Boston	†3¼	†3¼	3¼		
Magma Copper	N. Y. Curb			34	Jan. '19, Q	0.50
Mason Valley	N. Y. Curb	1¾	1¾	1¾		
Mass Consolidated	Boston	2	2	2	Nov. '17, Q	1.00
Miami Copper	New York	27½	26½	26½	Aug. '22, Q	0.50
Michigan	Boston	2½	2½	2½		
Mohawk	Boston	57½	56	56	July '22, Q	1.00
Mother Lode Coa.	N. Y. Curb			11	June '22, I	0.50
Nevada Consol.	New York	15¼	14½	14½	Sept. '20, Q	0.25
New Cornelia	Boston	17¾	16½	16½	Aug. '22, K	0.25
North Butte	Boston	9¼	8½	9	Oct. '18, Q	0.25
Ohio Copper	N. Y. Curb	*46	*38	*42		
Old Dominion	Boston	20	18½	18½	Dec. '18, Q	1.00
Osceola	Boston	30½	29½	29½	Aug. '22, Q	1.00
Phelps Dodge	Open Mar.	†175	†165		Oct. '22, Q	1.00
Quincy	Boston	34	33	33	Mar. '20, Q	1.00
Ray Consolidated	New York	14	13¾	13¾	Dec. '20, Q	0.25
Ray Hercules	N. Y. Curb	1½	1¼	1¾		
St. Mary's Min. Ld.	Boston	40	40	40	Apr. '22, K	2.00
Seneca Copper	Boston			7¼		
Shannon	Boston	*80	*70	*80	Nov. '17, Q	0.25
Shattuck Arizona	New York	9	8	8	Jan. '20, Q	0.25
South Lake	Boston	†1	†*30	*35		
Superior & Boston	Boston	1¾	1¾	1¾		
Tenn. C. & C. cfs	New York	9¼	9	9	May '18, I	1.00
Tuolumne	Boston	*45	*40	*40	May '13,	0.10
United Verde Ex.	Boston Curb	26¼	25½	26¼	Nov. '22, Q	0.25
Utah Consol.	Boston	2	2	2	Sept '18,	0.25
Utah Copper	New York	66¼	61¼	61½	Sept. '22, Q	0.50
Utah Metal & T.	Boston	1 1/16	1	1	Dec. '17,	0.30
Victoria	Boston	†1¼	†1	1		
Winona	Boston	1	1	1		
Wolverine	Boston	8	8	8		
NICKEL-COPPER						
Internat. Nickel	New York	15½	14½	14½	Mar. '19,	0.50
Internat. Nickel, pfd.	New York	80	80	80	Nov. '22, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	5½	5	5		
National Lead	New York	118	111½	111½	Sept. '22, Q	1.50
National Lead, pfd.	New York	112½	112½	112¼	Sept. '22, Q	1.75
St. Joseph Lead	New York	18¾	18	18	Sept. '22, Q	0.25
ZINC						
Am. Z. L. & S.	New York	17½	16¾	17	May '20,	1.00
Am. Z. L. & S. pfd.	New York	54¼	52	52	Nov. '20, Q	1.50
Butte C. & Z.	New York	8¼	8	8	June '18,	0.50
Butte & Superior	New York	33½	30½	30½	Sept. '20,	1.25
Callahan Zn-Ld	New York	8¼	8	8	Dec. '20, Q	0.50
New Jersey Zn.	N. Y. Curb	169½	167	167½	Nov. '22, Q	2.00
Yellow Pine	Los Angeles			*75	Sept. '20, Q	0.03
SILVER						
Batopolias Mining	New York	⅜	⅜	⅜	Dec. '0,7 I	0.12½
Beaver Consol.	Toronto	*33	*30½	*31	May '20, K	0.03
Coniagas	Toronto	2	2	2	May '21, Q	0.12½
Crown Reserve	Toronto	*28	*25	*28	Jan. '17,	0.05
Kerr Lake	N. Y. Curb	3¼	3¼	3¼	Oct. '22, Q	0.12½
La Rose	Toronto	*23	*21	*23	Apr. '22,	0.10
McKinley-Dar.-Sav.	Toronto	*23	*21½	*21½	Oct. '20, Q	0.03
Mining Corp. Can.	Toronto	1	1	1	Sept. '20, Q	0.12½
Nipissing	N. Y. Curb	6	5½	5½	Oct. '22, Q,X	0.30
Ontario Silver	New York	6½	6¼	6½	Jan. '19, Q	0.50
Temiskaming	Toronto	*32½	*32	*32½	Jan. '20, K	0.04
Trethewey	Toronto	5	4½	4½	Jan. '19,	0.05

Stock	Exch.	High	Low	Last		Last Div.
GOLD						
Alaska Gold	New York	⅜	⅜	⅜		
Alaska Juneau	New York	1½	1¼	1½		
Atlas	Toronto	*35½	*25	*26		
Carson Hill	Boston	7½	6⅞	7		
Cresson Consol. G.	N. Y. Curb	2⅜	2 7/16	2½	Oct. '22 Q.	0.10
Dome Mines	New York	46½	39¾	41¼	Oct. '22, Q	0.50
Golden Cycle	Colo. Springs			*91	June '21, Q	0.02
Goldfield Consol.	N. Y. Curb	*7	*6	*6	Dec. '19,	0.05
Hollinger Consol.	Toronto	12.60	12.25	12.35	Nov. '22,	0.05
Homestake Mining	New York	79	73	79	Oct. '22, M	0.25
Keora	Toronto	*9	*8½	9		
Kirkland Lake	Toronto	*46	*44	*45		
Lake Shore	Toronto	2.90	2.83	2.85	Aug. '22, Q	0.02
McIntyre- Porcupine	Toronto	18.95	18.10	18.35	Sept. '22, K	0.25
Porcupine Crown	Toronto	*25	*24	*24½	July '17,	0.03
Portland	Colo. Springs	†*40	†*35	*40	Oct. '20, Q	0.01
Schumacher	Toronto	*40	*39	40		
Teck Hughes	Toronto	*94½	*90	*90½		
Tom Reed	Los Angeles			*85	Dec. '19,	0.02
United Eastern	N. Y. Curb	1 1/16	1 1/16	1⅛	Oct. '22, Q	0.15
Vindicator Consol.	Colo. Springs	†*5	†*3	*4	Jan. '20, Q	0.01
Vipond Cons.	Toronto	*67	*64	*66		
White Caps Mining	N. Y. Curb	*13	*9	*13		
Wright-Hargreaves	Toronto	3.35	3.10	3.30	Oct. '22,	0.05
Yukon Gold	N. Y. Curb	*80	*70	*80	June '18,	0.02½
GOLD AND SILVER						
Boston & Montana	N. Y. Curb			*10		
Cons. Virginia	San Francisco	*12½	*12½	*12½		
Dolores Esperanza	N. Y. Curb	3	2⅝	2½	Oct. '22	2.50
El Salvador	N. Y. Curb	*3	*3	*3		
MacNamara M.&M.	N. Y. Curb	*8	*7	*8	May '10,	0.02½
Tonopah Belmont	N. Y. Curb	1⅜	1¼	1¼	July '22, Q	0.05
Tonopah Divide	N. Y. Curb	*82	*68	*78		
Tonopah Extension	N. Y. Curb	3¼	3 1/16	3¼	Oct. '22, Q	0.05
Tonopah Mining	N. Y. Curb	2 1/16	2⅛	2 3/16	Oct. '22, SA, X	0.07½
West End Consol.	N. Y. Curb			1¼	Sept. '22, SA	0.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*8	*7	*7	Jan. '21, M	0.01
Cardiff M. & M.	Salt Lake	*35	*35	*35	Dec. '20,	0.15
Chief Consol.	Boston Curb	5½	5¼	5⅜	Nov. '22, Q	0.10
Columbus Rexall	Salt Lake	*17½	*16	*16	Aug. '22,	0.03
Consol. M. & S.	Montreal	28½	26	27½	Oct. '20, Q	0.62½
Eagle & Blue Bell	Boston Curb	†*5	†*3	*3	Apr. '21, K	0.05
Electric Point	Spokane	*6	*6	*6	May '20, SA	0.03
Federal M. & S.	New York			12	Jan. '09,	1.50
Federal M. & S. pfd.	New York	58	56½	56½	Sept. '22, Q	1.25
Florence Silver	Spokane	*38	*36	*37½	Apr. '19,	0.01½
Grand Central	Salt Lake	†1	†*57	*61	Jan. '21, K	0.01
Hecla Mining	N. Y. Curb	8¼	8¼	8¼	Sept. '22, Q	0.15
Iron Blossom Con.	N. Y. Curb	*28	*28	*28	Apr. '22, Q	0.02½
Marsh Mines	N. Y. Curb	*10	*10	*10	June '21, I	0.02
Park City	Salt Lake	†3.60	†3.40	3.50		
Prince Consol.	Salt Lake	*11	*10	*10	Nov. '17,	0.02½
Rambler-Cariboo	Spokane	*5½	*3½	*3½	Feb. '19,	0.01
Stewart Mines	N. Y. Curb	*7	*7	*7	Dec. '15,	0.05
Tamarack-Custer	Spokane	3	2½	2½	Jan. '21, K	0.04
Tintic Standard	Salt Lake	3.20	3.12½	3.12½	Sept. '22, K	0.05
Utah Apex	Boston	3¼	2¼	3	Nov. '20, K	0.25
IRON						
Bethlehem Steel "B"	New York	72¾	68¼	68¼	Oct. '22	1.2
Char. Iron	Detroit			1½		
Char. Iron, pfd.	Detroit			2½		
Colorado Fuel & Iron	New York	30¾	28¼	28½	May '21	0.75
Col. Fuel & Iron, pfd.	New York			105	Aug. '22	2.00
Gt. North'n Iron Ore	New York	35½	34½	34½	Nov. '20	1.50
Inland Steel	N. Y. Curb			48½	Sept. '22	1.00
Mesabi Iron	N. Y. Curb	11¾	10½	10½		
Replogle Steel	New York	28½	26¼	26½		
Republic I. & Steel	New York	53	47	47½	May '21	1.50
Rep. Iron & St., pfd	New York	85	82½	82½	Jan. '22	1.75
Sloss-Sheffield S. & I.	New York	45	43	43	Feb. '21	1.50
U. S. Steel	New York	110¾	105¼	105½	Sept. '22	1.25
U. S. Steel, pfd.	New York	121¼	120¾	120¾	Aug. '22	1.75
Virginia I. C. & C.	New York	58	57	57	Jan. '22	1.50
Virginia I.C.&C.,pfd.	New York	84	84	84	July '22	2.50
VANADIUM						
Vanadium Corp.	New York	41¼	36¼	36¼	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp.	Montreal	68½	67	67½	Oct. '22, Q	1.50
Asbestos Corp. pfd.	Montreal	85	82	83	Oct. '22, Q	1.75
SULPHUR						
Freeport Texas	New York	22¾	20¼	20¼	Nov. '19, Q	1.00
Texas Gulf	New York	67¼	61½	62	Sept. '22, QX	1.00
MINING, SMELTING AND REFINING						
Amer. Metal	New York	49¼	48	48	Sept. '22,	0.75
Amer. Metal pfd.	New York	112½	112½	112½	Sept. '22, Q	1.75
Amer. Sm. & Ref.	New York	59¼	55	55¼	Mar. '21, Q	1.00
Amer. Sm.& Ref. pfd	New York	103¾	102⅛	102⅛	Sept. '22 Q	1.75
Am. Sm. Sec. pfd. A.	New York	101⅛	100⅛	101⅛	Oct. '22, Q	1.50
U. S. Sm. R. & M.	New York	40	39	39	Jan. '21, Q	0.50
U.S. Sm.R.& M. pfd.	New York	46	46	46	Oct. '22 Q.	0.87½

*Cents per share. †Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.

Toronto quotations courtesy Hamilton B. Wills; Spokane, Pohlman Investment Co; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Mines and Oil; Colorado Springs, The Financial Press, N. Y.

NEW MACHINERY AND INVENTIONS

Device for the Protection of Feeder Sections on Mining Trolley Lines

A new automatic sectionalizing contactor for mining use that automatically cuts out of service feeder sections on which short circuits or overloads occur and returns them into service again only when the trouble has been cleared has recently been placed on the market by the Westinghouse Electric & Manufacturing Co. The contactor is entirely automatic in operation, opening on overloads and reclosing only when the potential difference between the feeder sections is sufficiently small to limit the flow of current on reclosure to less than the overload setting on a relay.

An overload relay, a main contactor, a holding relay, a snap switch, fuses, a resistor, and terminals are used in the construction of the contactor. This apparatus is assembled on a slate panel and is mounted in a wooden box for outdoor service. The box is lined on all sides and on the top with heavy sheet asbestos and is provided with holes in the bottom for bringing in the cables. Suitable hanger irons for suspending the box from the cross arm of a pole are mounted on the rear.

The main contactor is of the clapper type, with a blow-out coil and an arc chute. The overload and holding relays are similar to each other (except for the coils), and are simple and reliable in operation. Both relays are automatically reset, the moving core dropping back by gravity and spring pressure when the operating coil is deenergized. The terminals are placed in a convenient position at the bottom of the panel, just above the holes in the floor of the box, so that cables can be easily brought in and connected.

The overload relay has an operating range of from one to two, so that the relay can be set for any desired load within wide limits. The holding relay can be arranged to release the main contactor on a difference of potential between feeder sections of from approximately 30 v. to 100 v. or even higher.

Manganese Steel Sand and Gravel Pumps

With the object of designing a pump possessing the highest efficiency and minimum cost of repair parts and repair labor, a study of numerous sand and gravel pumps in operation under various conditions of service has been made by the American Manganese Steel Co. As a result, a design which is said to embody numerous features that have eliminated the early difficulties experienced in this class of equipment has been evolved. The use of manganese steel in place of cast iron and steel parts has resulted in a much longer life to the pumps, with added efficiency and safety.

The Amsco pump shell has no stud bolts. The two side plates have slotted flanges corresponding with the slotted flanges in the shell. Into these slots bolts are dropped. This assures the operator that no more stud bolts will be broken or studs worn off by the abrasion of the sand. The side plates are quickly removed. The gaskets between side plates and shell are solid rings, no holes being punched into them to fit over the stud bolts. The suction side plate projects into the opening of the runner. No sand or gravel can drop between runner or side plate. The opening between runner vanes is large, thus permitting all solids to enter and pass through easily. The hub of the runner does not project inside of the runner, but is on the far side, offering no resistance to the flow of material.

The shaft of the Amsco pump is larger in diameter than other pumps of the same size. It is supported by a large bearing placed close to the pump, reducing the overhang of the shaft to a minimum, which eliminates vibration and springing and breaking of the shaft.

The packing gland is placed close to the runner and is protected from sand by close fitting of the side plate around the shaft and a water seal. The thrust is taken up by thrust collars in the main bearings and a ball-bearing thrust collar. By reversing the side plates, the pump can be changed from a left-hand to a right-hand pump. The only new part required is a runner for right-or-left-hand operation as operating conditions may demand. Amsco pumps are made in 6-, 8-, 10-, 12-, 15-in. and larger sizes to meet every requirement of sand and gravel pumping in the construction of dikes, fills, impounding tailings, milling operations, and similar work. Complete information regarding Amsco pumps can be had by addressing the American Manganese Steel Co., Chicago Heights, Ill.

INDUSTRIAL NOTES

The Osgood Co., Marion, Ohio, has established a district sales office in New York City at 50 Church St., with M. E. Pullen in charge.

The Cleveland Rock Drill Co. has transferred its Pacific Coast headquarters from 515 Mission St., San Francisco, to 509 Peoples Bank Building, Sacramento, Calif. P. T. Albert is in charge.

W. W. Sayers has been promoted to the position of chief engineer of the Link-Belt Philadelphia works and Eastern operations. For many years Mr. Sayers was a representative of the company in its Chicago territory. His headquarters will be at the Philadelphia office.

TRADE CATALOGS

Piston Ring Testers — Société Anonyme Adolphe Saurer, Arbon, Switzerland, has issued a 4-p. pamphlet descriptive of the Saurer piston ring testing apparatus for verifying the pressure of piston rings. The apparatus is manufactured in seven sizes.

Diesel Engines—Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo., has issued an 8-p. folder, five pages of which are devoted to illustration of some of the installations made by the company. The features of Diesel economy are pointed out in the type matter, and attention is also called to the simplicity and reliability of Busch-Sulzer Diesels.

War Surplus—Under the foregoing title, the Sales Promotion Section of the War Department, 2515 Munitions Building, Washington, D. C., has issued a 24-p. booklet which describes in a general way the methods of sale resorted to by the War Department in the disposal of its vast stocks of surplus property, and tells what these stocks contain. Purchasing agents for mining companies will find it worth while to keep advised of the offerings, which are extensive in scope.

Engineering Tables—P. H. & F. M. Roots Co., Connersville, Ind., have prepared and issued a 32-p. booklet (Bulletin No. 118) "Engineering Tables," which will be found invaluable to the engineer having to do with blowers, gas exhausters, and pumps. An earlier edition, compiled by George C. Hicks, was distributed by this company, and the most important of these tables have been reprinted and are combined with new material, which makes the present edition of considerable value. No attempt has been made to compete with handbooks covering a complete profession, and the material included represents a condensation of data to the point where the designation "engineering tables" is most specific.

Pumps—We have received, in a convenient folder, a number of bulletins, descriptive of pumps, which has been sent us by the Goulds Manufacturing Co., Seneca Falls, N. Y. The bulletins cover the following types of pumps: Double-acting, single-cylinder piston; single-acting, triplex plunger—outside-guided and high-pressure types; double-acting, triplex piston, vertical type; single-stage, single side, suction centrifugal; vacuum and stuff; deep well triplex; portable mine; single-stage, double-suction centrifugal; centrifugal sump; rotary; double-acting plunger; single-acting, triplex pressure; centrifugal fire; single-stage, single suction centrifugal; multi-stage centrifugal, and steam turbine driven centrifugal pumps. In addition, two bulletins, one giving handy data on power pumping and the other centrifugal pump data, are included.